(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 248 034 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
09.10.2002 Bulletin 2002/41

(51) Int Cl.[7]: **F21V 14/02**, F21V 14/08
// F21W101:10

(21) Application number: **02007675.8**

(22) Date of filing: **04.04.2002**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **04.04.2001 JP 2001105302**

(71) Applicant: **ICHIKOH INDUSTRIES, LTD.**
Tokyo 144-0022 (JP)

(72) Inventors:
- **Akizuki, Kunio**
  Isehara-shi, Kanagawa-ken 259-1192 (JP)
- **Nakabayashi, Yasumitsu**
  Isehara-shi, Kanagawa-ken 259-1192 (JP)

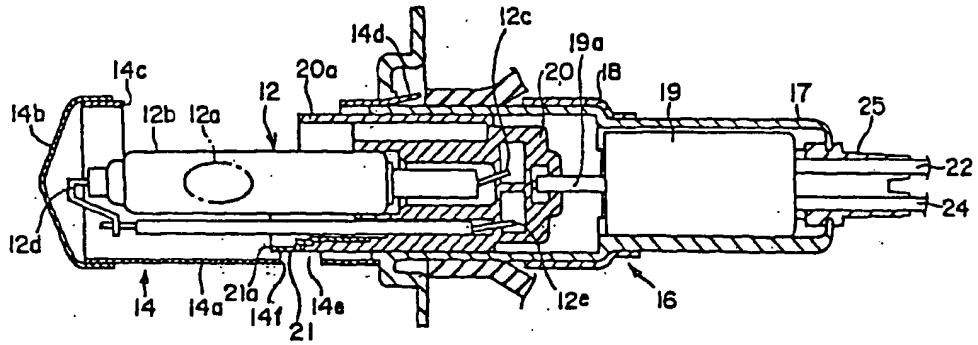
(74) Representative: **Grünecker, Kinkeldey,**
Stockmair & Schwanhäusser Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)

(54) Lamp device for vehicle

(57) A vehicle headlamp comprises a driving mechanism, including a solenoid (19), capable of moving a bulb (12) and a shutter (21) into a first and a second position. When the bulb (12) and the shutter (21) are in said first position the shutter (21) closes the window (14e). Thus the light emitted by the light emitting portion (12a) of the bulb (12) passing through the opening (14c) of the shade (14), is reflected by the reflector (13) and forms a first light distribution pattern (B1).

When the bulb (12) and the shutter (21) are positioned in said second position the window (14c) is open; thus part of the light emitted by the light emitting portion (12a) of the bulb (12) can escape through the window (14e), is reflected by the reflector (13) and forms, together with the light emitted through the opening (14c), a second light distribution pattern (B2).

FIG.3B



EP 1 248 034 A2

Description

FIELD OF THE INVENTION

[0001] The present invention relates to a lamp device for vehicles in which it is possible to switch the light distribution pattern by moving the valve with respect to the reflector.

BACKGROUND OF THE INVENTION

[0002] A prior art lamp device of this type has been disclosed, for example, in Japanese Patent Application Laid-Open No. 2001-35211 (EP 1052448 A2).

[0003] The head lamp disclosed in the above-mentioned reference uses the high intensity discharge (HID) valve as a light source. This head lamp is configured such that it is possible to switch with a single HID valve between a light distribution pattern of a low beam and a light distribution pattern of a high beam, and securely prevent the glare.

SUMMARY OF THE INVENTION

[0004] It is an object of the invention to provide a lamp device which can effectively utilize a lighting luminous flux emitted from one valve in correspondence to a light distribution pattern.

[0005] The lamp device for vehicles according to one aspect of the present invention comprises a valve which emits a lighting luminous flux, a reflector which reflects the lighting luminous flux emitted from a light source of the valve, the reflector having an optic axis, a shade which covers a specific portions of the valve to restrict the lighting luminous flux falling on the reflector, and a valve holder which holds the valve, and a moving mechanism which moves the valve holder along the optical axis. A window is formed in the shade, there is provided a shutter which opens or closes the window base on the movement of the valve. A part of the lighting luminous flux is introduced to the reflector from the window when the shutter opens the window.

[0006] The lamp device for vehicles according to another aspect of the present invention comprises a reflector, a valve which has a single light source, a valve holder which holds the valve in the reflector so as to freely move in a direction of an optical axis, a fixed shade fixed to the valve holder and which has a window formed therein, a shutter which opens and closes the window, and a moving mechanism which moves the valve and the shutter in an interlocking manner between a first position and a second position. When the valve and the shutter are positioned at the first position, the light source is positioned at a first light source position, the shutter closes the window, and the lighting luminous flux from the light source is reflected by the reflector, whereby a first light distribution pattern is obtained. When the valve and the shutter are positioned at the second position, the light source is positioned at a second light source position, the shutter opens the window, and the lighting luminous flux from the light source is reflected by the reflector, whereby a second light distribution pattern is obtained.

[0007] Other objects and features of this invention will become apparent from the following description with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Fig. 1A is an explanatory diagram of a light distribution pattern when the beam is set low which shows a lamp device according to an embodiment of the present invention,

Fig. 1B is an explanatory diagram along a line B-B in Fig. 1C, which shows a reflection range of a lighting luminous flux in a reflector,

Fig. 1C is an explanatory diagram which shows a relationship among a valve, a window and the reflector when the beam has been set low,

Fig. 2A is an explanatory diagram of a light distribution pattern when the beam is set high which shows a lamp device according to an embodiment of the present invention,

Fig. 2B is an explanatory diagram along a line B-B in Fig. 2C, which shows a reflection range of a lighting luminous flux in a reflector,

Fig. 2C is an explanatory diagram which shows a relationship among a valve, a window and the reflector when the beam has been set high,

Fig. 3A is a side elevational view which shows a valve peripheral configuration when the beam has been set low,

Fig. 3B is a vertical cross sectional view which shows the valve peripheral configuration when the beam has been set low,

Fig. 4A is a side elevational view which shows the valve peripheral configuration when the beam has been set high in the same manner,

Fig. 4B is a vertical cross sectional view which shows the valve peripheral configuration when the beam has been set high,

Fig. 5A is a side elevational view of a shade,

Fig. 5B is a plan view of a shade,

Fig. 5C is a cross sectional view along a line A-A in Fig. 5A,

Fig. 6 is an explanatory diagram which compares amoving position of a light source between a HID valve and an H4 valve with double filaments in the same manner, that is, an explanatory diagram which shows a relationship between the position of the light source at a time when the HID valve is at the low beam and the high beam, and positions of the respective filaments of the H4 valve, and

Fig. 7 is an explanatory diagram which shows a re-

lationship of relative positions among the light source, the window and the reflector in a state in which the window is open, in the same manner.

DETAILED DESCRIPTIONS

[0009] An embodiment of the lamp device according to this invention will be explain below with reference to the accompanying drawings.

[0010] The lamp device according to this invention is configured such as to be mounted to a motor vehicle sectioned in a left-hand traffic. Accordingly, a lamp device mounted to a motor vehicle sectioned in a right-hand traffic can be configured so as to be mirror reversed with respect to the lamp device according to this embodiment.

[0011] Fig. 1A is an explanatory diagram of a light distribution pattern when the beam is set low which shows a lamp device according to an embodiment of the present invention. Fig. 1B is an explanatory diagram along a line B-B in Fig. 1C, which shows a reflection range of a lighting luminous flux in a reflector. Fig. 1C is an explanatory diagram which shows a relationship among a valve, a window and the reflector when the beam has been set low. Fig. 2A is an explanatory diagram of a light distribution pattern when the beam is set high which shows a lamp device according to an embodiment of the present invention. Fig. 2B is an explanatory diagram along a line B-B in Fig. 2C, which shows a reflection range of a lighting luminous flux in a reflector. Fig. 2C is an explanatory diagram which shows a relationship among a valve, a window and the reflector when the beam has been set high.

[0012] As shown in Figs. 1A to 1C and Figs. 2A to 2C, the lamp device 11 is provided with a valve 12 which emits a lighting luminous flux, a reflector 13 which reflects the lighting luminous flux emitted from the valve 12, a shade (fixed shade) 14 which restricts the lighting luminous flux outgoing to the reflector 13 by covering a predetermined range of the valve 12, and a drive section case 16 held in a valve holder (not shown) which mounts the valve 12 thereto and integrally or independently provided in the reflector 13.

[0013] The valve 12 may be the HID valve (also called as a discharge lamp or a xenon arc lamp) corresponding to a standard of H4 valve, an H12 valve or the like. For explanation purpose, it will be assumed that the valve 12 is the HID valve corresponding to the standard of the H4 valve. The valve 12 is, as shown in Figs . 3B and 4B, provided with a glass vessel 12b internally provided with a light emitting section (single light source) 12a, a power source line 12c in which a front end D1 (refer to Figs. 6 and 7) is connected to one end of the light emitting section 12a and a base end is protruded from a base end of the glass vessel 12b, a power source line 12d in which a base end D2 (refer to Figs. 6 and 7) is connected to another end of the light emitting section 12a and a front end is protruded from a front end of the glass vessel 12b, and an earth line 12e connected to a front end of the power source line 12d.

[0014] The reflector 13 is formed in a free curved surface around an optical axis O corresponding to a center axis, or in a rotation parabolic surface or the like, and the surface is set to a reflection surface. When the light emitting section 12a is at a low beam position (details are described later), the lighting luminous flux emitted from a center P of the light source (light emitting section 12a) is reflected by the reflector 13, whereby a light distribution pattern B1 of the low beam shown in Fig. 1A is obtained. Further, when the light emitting section 12a is at a high beam position (details are described later), the lighting luminous flux emitted from the light source center P is reflected to the reflector 13, whereby a high beam light distribution pattern B2 shown in Fig. 2A is obtained.

[0015] The shade 14 is provided, as shown in Figs. 5A and 5, with a shade main body 14a which has a circular arc shape of the like positioned below the optical axis O of the valve 12, and a cap 14b emitted from a front end of the valve 12 and which shuts the lighting luminous flux directly outgoing to a lens which is omitted to be shown. The cap 14b commonly serves as a blindfold making the front end of the valve 12 invisible from the external section.

[0016] The shade main body 14a is provided for the purpose of shutting the lighting luminous flux forming an upward glare light due to the reflection in the lower section of the reflector 13, that is, the lighting luminous flux outgoing from the valve 12 toward the lower side of the reflector 13. An opening 14c for opening from a section slightly below the optical axis O toward an upper section, and a window 14e formed substantially all the width in a width direction are respectively opened in the shade main body 14a. Further, a hook section 14d fixed to a drive section case 16 is integrally formed in the shade main body 14a. One (which becomes reverse in correspondence to a placing position in right and left of a vehicle) of cut lines in both sides of the opening 14c is an angle of center θ3 down from the horizontal line, as shown in Fig. 5C. Accordingly, an area θ3 moving downward from the horizontal line including the optical axis O in an effective reflection area θ1 shown in Figs. 1B and 2B is determined (in this embodiment, θ3 = 15 degrees).

[0017] The drive section case 16 corresponds to a valve holder which has a moving mechanism. The drive section case 16 is provided with a substantially closed-end cylindrical holder 17 which opens the valve 12 side, a waterproofing tube 18 which covers an opening (not shown) formed in the holder 17, a solenoid 19 provided in an inner section in a side of abase section of the holder 17, a slider 20 provided in an inner section in a side of a front end of the holder 17 and connected to an axis 19a of the solenoid 19 so as to move along a direction of the optical axis within the holder 17, and a shutter 21 fixed to the slider 20.

[0018] The valve 12 is fixed to the slider 20. As a re-

sult, the valve 12 is held in the reflector 13 via the valve holder so as to freely move in the direction of the optical axis. The shade 14 is fixed to the holder 17.

[0019] The solenoid 19 employs a two-way solenoid. This solenoid 19 is configured such that the axis 19a contracting from an extended state (a state shown in Fig. 3B) and on the contrary the axis 19a extends from the contracting state (a state shown in Fig. 4B), when an electric current is supplied. The solenoid 19 is configured such that the axis 19a extends so as to stop at a predetermined position (a position shown in Fig. 3B), and on the contrary the axis 19a contracts so as to stop at a predetermined position (a position shown in Fig. 4B). The solenoid 19 is configured such that it is not necessary to supply the electric current thereto because the stop state is kept by an internal magnet after the axis 19a stops at the predetermined position. Accordingly, since the lamp device need only a small amount of electric power and is required to supply the electric current fro a shorter time, the solenoid 19 is not heated within the holder 17.

[0020] Electric power supplying wiring cords 22 to 24 for supplying the electric current are connected to the solenoid 19. In the wiring cords 22 to 24, an airtight property between the interior section of the holder 17 and the external section is kept by a guide packing 25. Further, a waterproof property is kept by a waterproofing tube 18. Accordingly, the solenoid 19 in the internal section is not affected by the water.

[0021] An oscillating amount of the axis 19a of the solenoid 19 is made substantially coincide with an apart distance (standard) between the filaments F1 and F2 of the so-called double filament type H4 valve, as shown in Fig. 6. That is, in the valve 12, it is set such that a distance between a front end D1 of a lead wire 12c at a time when the light emitting section 12a is positioned (shown by a solid line in Fig. 6) at the low beam position (the first light source position), and a base end D2 of a lead wire 12d at a time when the light emitting section 12a is positioned (shown by a double-dot chain line in Fig. 6) at the high beamposition (the second light source position) becomes 1.7 mm. On the contrary, in the valve 12, a distance between front ends of the respective lead wires 12c and 12d is standardized and set to 4.0 mm. As a result, a moving amount of the axis 19a of the solenoid 19 is 1.7 + 4.0 = 5.7 mm.

[0022] A position of the front end D1 of the lead wire 12c at a time when the light emitting section 12a is positioned at the low beam position coincides with a position of a virtual base end surface d1 of the filament F1. Further, a position of the base end D2 of the lead wire 12d at a time when the light emitting section 12a is positioned at the high beam position coincides with a position of a virtual base end surface d2 of the filament F2. Therefore, it is possible to replace the H4 valve and the valve 12 (including the drive section case 16 corresponding to the shade 14 and the valve holder) with each other. In other words, the reflector 13 can be commonly used between the valve 12 and the H4 valve.

[0023] A "play" allowing a relative change of angle, that is, a change of angle of the axis 19a is provided between the slider in the side of the valve 12 and the shutter 21, and holder 17 in the side of the valve holder. The "play" is configured such that even when the axis 19a does not necessarily coincide with the optical axis O due to a mounting state of the solenoid 19, it is possible to securely transmit the drive force of the solenoid 19 to the slider 20. Therefore, it is possible in the lamp device to slide the valve 12 fixed to the slider 20 in the direction of the optical axis O (a longitudinal direction, that is, a lateral direction in the drawing) by driving the solenoid 19.

[0024] A valve rear shade section 20a extended to a rear upper section of the valve 12 is integrally formed in an upper section of the front end of the slider 20. The valve rear shade section 20a is provided for the purpose of shielding the light diffusing obliquely rearward from the valve 12 on the basis of a predetermined light distribution property. The valve rearward shade section 20a integrally moves with the valve 12 interlocking with the operation of the solenoid 19. Therefore, it is possible in the lamp device to always shield the light diffusing obliquely rearward from the valve 12 on the basis of the same light distribution property.

[0025] The shutter 21 is provided with a width larger than that of the window 14e, and is formed so as to cover an upper section (inner side) of the window 14e in cooperation with the slider 20 at a time when the axis 19a is in an extending state. The shutter 21 opens at least an upper section (inner side) close to a front section of the window 14e at a time when the axis 19a is in a contracting state.

[0026] The lamp device according to this embodiment has the configuration mentioned above, and an operation thereof will be explained below.

[0027] The state in which the axis 19a extends due to the operation of the solenoid 19 corresponds to the light distribution state of the low beam. At this time, the valve 12 and the shutter 21 are positioned at the first position, as shown in Figs. 1A and 3A. The light emitting section 12a is positioned at the first light source position, as shown by a solid line in Fig. 6. That is, the light emitting position 12a is positioned at a position apart from the reflector 13, and on the contrary, the window 14e is closed. As a result, as shown in Fig. 1B, a part of the lighting luminous flux emitted from the valve 12 is shielded by the shade 14 and the shutter 21, whereby the lighting luminous flux is reflected by utilizing the effective reflection area θ1 slightly protruding from the horizontal position including the optical axis O in all the reflection area (360 degrees) of the reflector 12 (a protruding direction is different in correspondence to setting in right or left of the vehicle body), transmits through a lens (not shown), and lights up the forward section of the vehicle body on the basis of the light distribution pattern mainly having the lower section of the horizontal line including

the optical axis O (the light distribution pattern of the low beam).

[0028] The state in which the axis 19a contracts due to the operation of the solenoid 19 corresponds to the light distribution state of the high beam. At this time, the valve 12 and the shutter 21 are positioned at the second position, as shown in Figs. 2A to 2C and Fig. 4A and 4B. The light emitting section 12a is positioned at the second light source position. That is, the light emitting position 12a is positioned at a position close to the reflector 13, and on the contrary, the window 14e is opened. As a result, as shown in Fig. 2B, a part of the lighting luminous flux emitted from the valve 12 is shielded by the shade 14, whereby the lighting luminous flux is reflected by utilizing the effective reflection area θ1 and simultaneously transmits through the window 14e, thereby being reflected by utilizing the second effective area θ2, transmits the lens (not shown), and lights up the forward section of the vehicle body on the basis of the light distribution pattern straddling substantially in all the circumferential direction (the light distribution pattern of the high beam), as shown in Fig 2A.

[0029] Therefore, the lamp device according to this embodiment can easily light up a near side in the forward section of the vehicle body in spite of the light distribution state of the high beam, and can effectively utilize the lighting luminous flux.

[0030] The shutter 21 is fixed to the slider 20. Therefore, the lamp device according to this embodiment is not necessarily provided with a specific moving mechanism (for exampie, a solenoid, a pulse motor, a control circuit and the like) whichmoves the shutter 21, it is possible to improve an accuracy of relative position between the light source position and the shutter, it is possible to prevent a turbulence of the light distribution from being generated by the movement of the shutter, and it is possible to inexpensively and securely achieve an effective utilization of the high beam light distribution state.

[0031] Since the lamp device according to this embodiment is configured, as shown in Fig. 7, such that a light source center (a center of the light emitting section 12a) P is positioned in a forward side from an edge section 14f of the window 14e under the open state, it is possible to utilize a reflector section W which is farthest from the light source center P and has a lot of luminous flux as the effective reflection surface. In particular, since it is impossible to set the window 14e to be large in the configuration in which the moving amount of the valve is set to be small, it is advantageous in view of the configuration by utilizing the reflector section W in which the amount of luminous flux is most. Further, in the lamp device according to this embodiment, as shown by a solid line in Fig. 6, when the configuration is made such that the edge section 14f in the forward side of the window 14e is positioned on a vertical line of the front end D1 of the lead wire 12c, it is possible to further effectively utilize a depth range W which passes through the window 14e without being shielded by the front end 21a of the shutter 21 from the base end D2 of the lead wire 12d so as to reach the base section side of the reflector 13. According to this invention, the configuration may be made such that the window 14e is arranged below the valve 12.

[0032] The lamp device according to this embodiment can securely prevent an exposure by positioning the front end 21a of the shutter 21 when closing the window 14e in the side of the lighting direction rather than the window 14e so as to overlap with the shade main body 14a. In order to more securely prevent the exposure, the configuration may be made such as to overlap in a state of moving the shutter 21 apart from the shade main body 14a.

[0033] Although the invention has been described with respect to a specific embodiment for a complete and clear disclosure, the appended claims are not to be thus limited but are to be construed as embodying all modifications and alternative constructions that may occur to one skilled in the art which fairly fall within the basic teaching herein set forth.

Claims

1. A lamp device for vehicles comprising:

   a valve which emits a lighting luminous flux;
   a reflector which reflects the lighting luminous flux emitted from a light source of the valve, the reflector having an optic axis;
   a shade which covers a specific portions of the valve to restrict the lighting luminous flux falling on the reflector;
   a valve holder which holds the valve; and
   a moving mechanism which moves the valve holder along the optical axis;

   wherein a window is formed in the shade, there is provided a shutter which opens or closes the window base on the movement of the valve,

   wherein a part of the lighting luminous flux is introduced to the reflector from the window when the shutter opens the window.

2. The lamp device according to claim 1, wherein the shutter is fixed to the moving mechanism.

3. The lamp device according to claim 1, wherein the valve is an HID valve, and moving positions of the light source substantially coincide with positions of the respective filaments in a double filament type valve.

4. The lamp device according to claim 1, wherein the window is arranged in a lower section of a body of the vehicle from the light source, and a center of the

light source at a time when the valve and the shutter move so as to open the window is positioned in a side in a lighting direction from an edge section positioned close to the lighting direction of the window.

5. The lamp device according to claim 1, wherein the front end of the shutter overlaps from the window so as to overlap with the shade when closing the window by the shutter.

6. The lamp device according to claim 1, wherein the moving mechanism of the valve holder is constituted by a two-way solenoid.

7. The lamp device according to claim 1, wherein a waterproofing tube is provided in the valve holder.

8. The lamp device according to claim 1, wherein a play allowing a relative change of angle is provided between a side of the valve and the shutter, and a side of the valve holder.

9. The lamp device according to claim 1, wherein a valve rear shade section which moves integrally with the valve is integrally formed in the moving mechanism.

10. A lamp device for vehicles comprising:

a reflector;
a valve which has a single light source;
a valve holder which holds the valve in the reflector so as to freely move in a direction of an optical axis;
a fixed shade fixed to the valve holder and which has a window formed therein;
a shutter which opens and closes the window; and
a moving mechanism which moves the valve and the shutter in an interlocking manner between a first position and a second position,

wherein when the valve and the shutter are positioned at the first position, the light source is positioned at a first light source position, the shutter closes the window, and the lighting luminous flux from the light source is reflected by the reflector, whereby a first light distribution pattern is obtained, and

wherein when the valve and the shutter are positioned at the second position, the light source is positioned at a second light source position, the shutter opens the window, and the lighting luminous flux from the light source is reflected by the reflector, whereby a second light distribution pattern is obtained.

11. The lamp device according to claim 10, wherein the shutter is fixed to the moving mechanism.

12. The lamp device according to claim 10, wherein the valve is an HID valve, the first light source position substantially coincides with a position of a first filament in a double filament type valve, and the second light source position substantially coincides with a position of a second filament in the double filament type valve.

13. The lamp device according to claim 10, wherein the window is arranged in a lower section of a vehicle body from the light source, and a center of the light source at a time when the window is open is positioned in a side in a lighting direction from an edge section in the lighting direction of the window.

14. The lamp device according to claim 10, wherein the shutter overlaps with the shade in the edge of the window at a time when the window is closed.

15. The lamp device according to claim 10, wherein the moving mechanism of the valve holder is constituted by a two-way solenoid.

16. The lamp device according to claim 10, wherein a waterproofing tube is provided in the valve holder.

17. The lamp device according to claim 10, wherein a play allowing a relative change of angle is provided between a side of the valve and the shutter, and a side of the valve holder.

18. The lamp device according to claim 10, wherein a valve rear shade section which moves integrally with the valve is integrally formed in the moving mechanism.

FIG.1A

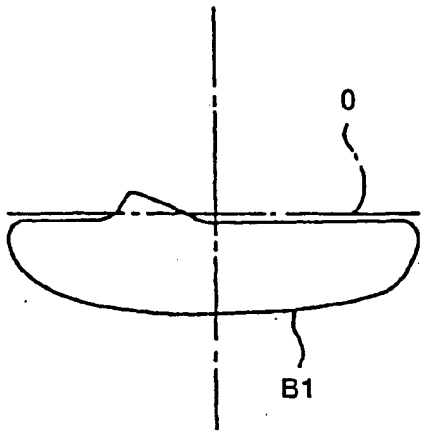


FIG.1B

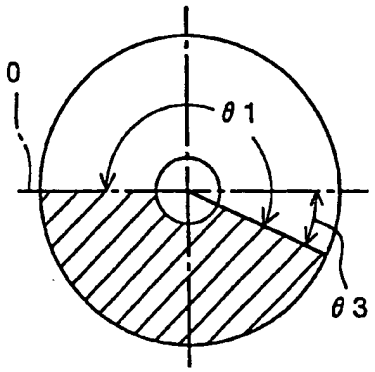


FIG.1C

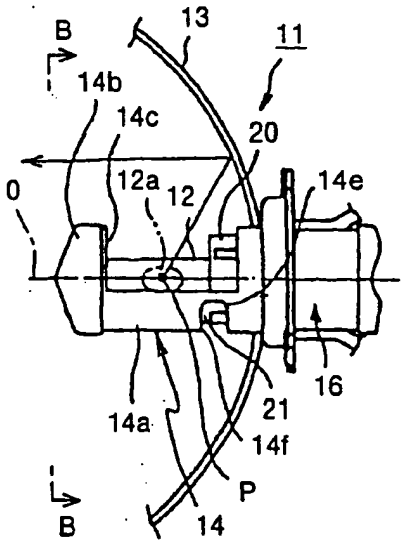


FIG.2A

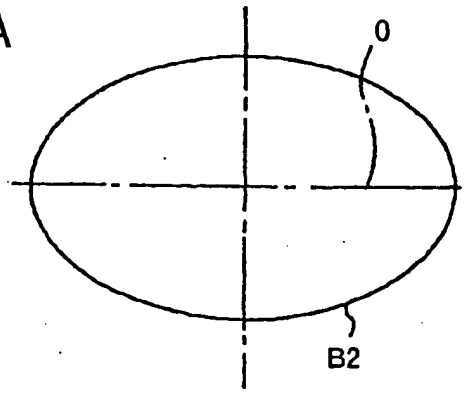


FIG.2B

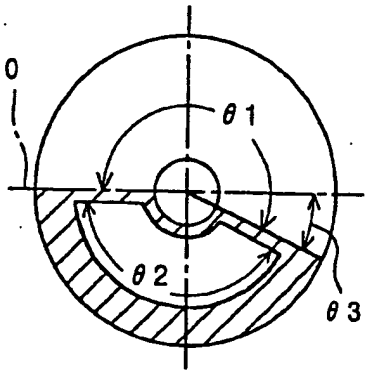


FIG.2C

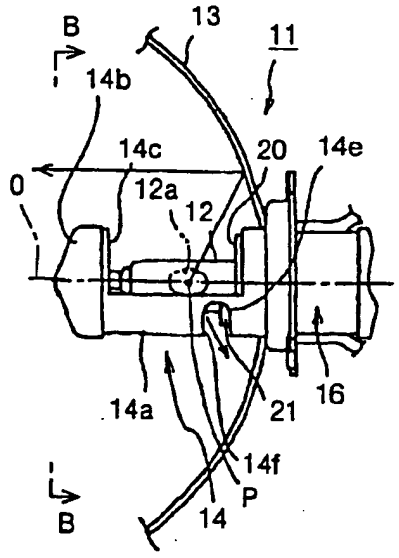


FIG.3A

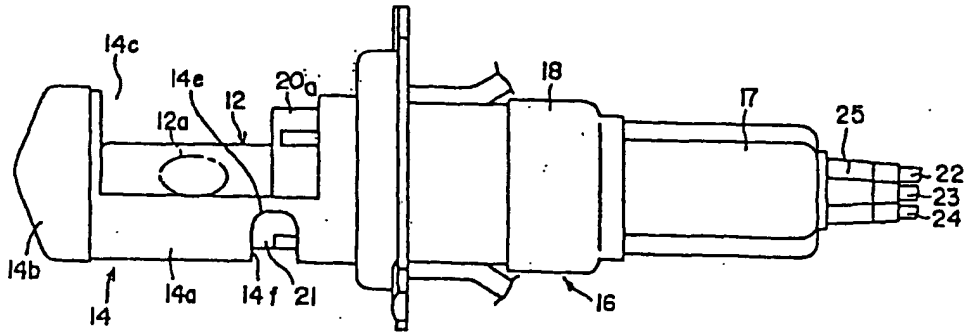

14c
14e
12
20a
18
17
25
12a
22
23
24
14b
14
14a
14f
21
16

FIG.3B

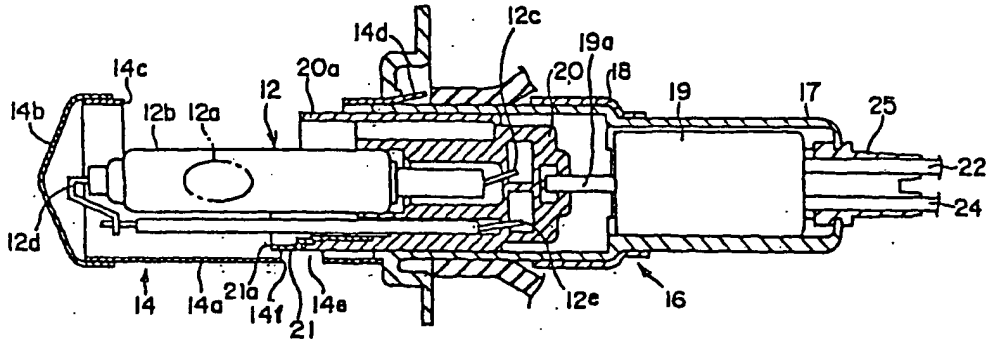

14d
12c
19a
14c
20a
20
18
19
17
25
12
14b
12b
12a
22
24
12d
14
14a
21a
14f
21
14e
12e
16

FIG.4A

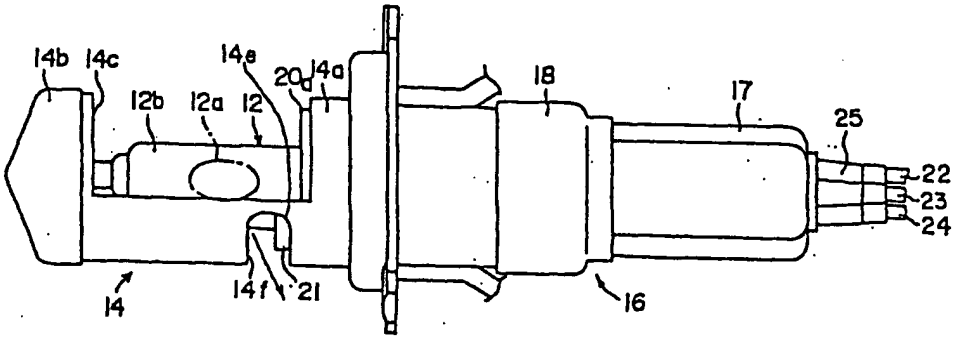

14b
14c
14e
20a
14a
18
17
25
12b
12a
12
22
23
24
14
14f
21
16

FIG.4B

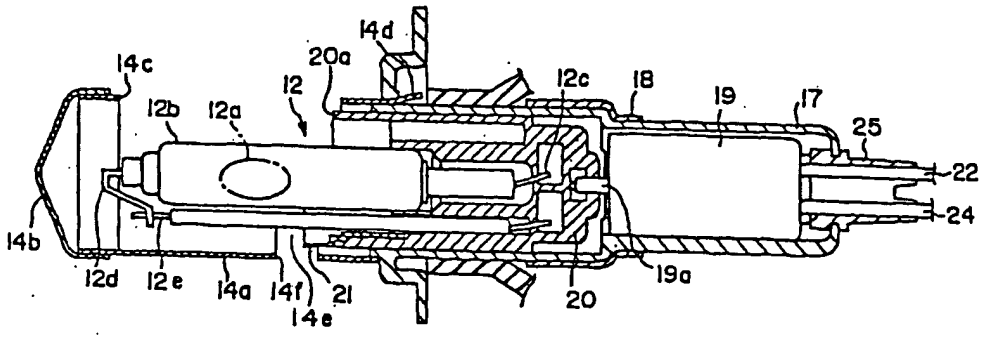

14d
14c
20a
12
12c
18
19
17
25
12b
12a
22
24
14b
12d
12e
14a
14f
21
19a
20
14e

FIG.5A

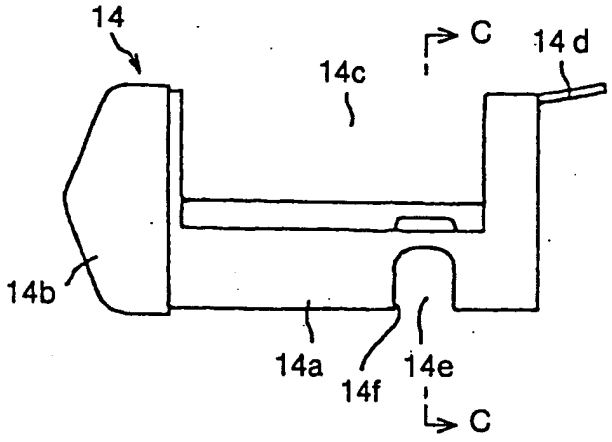


FIG.5B

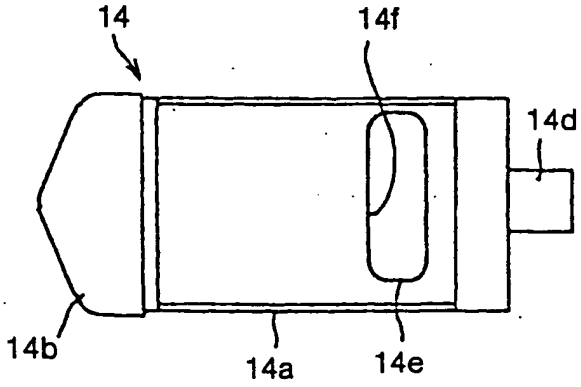


FIG.5C

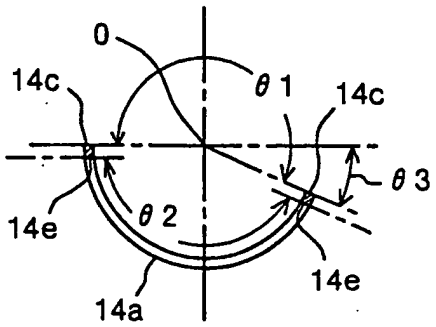


FIG.6

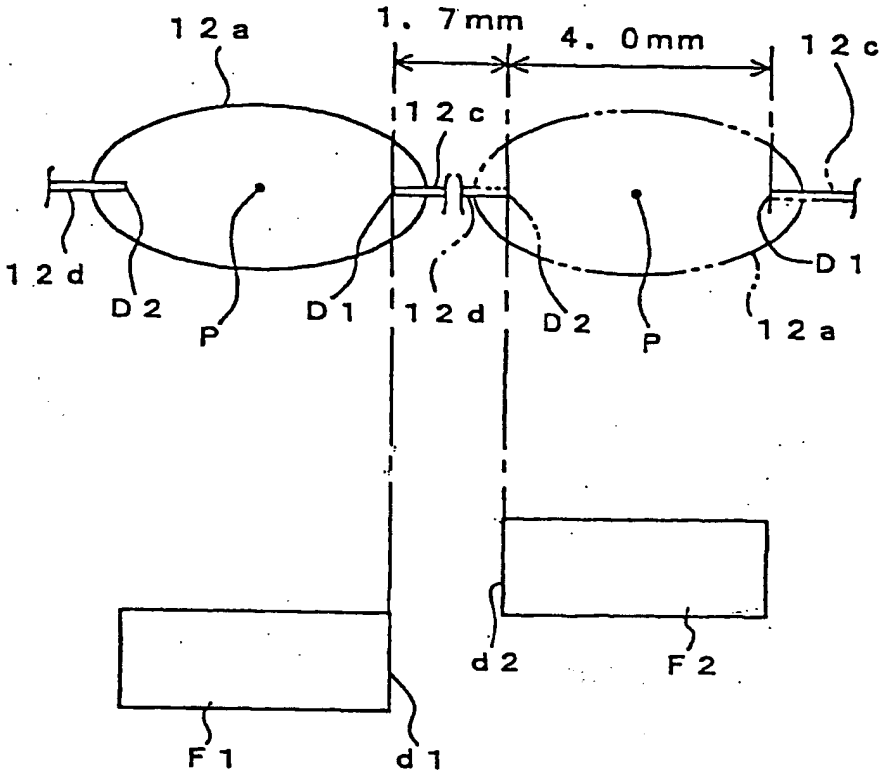
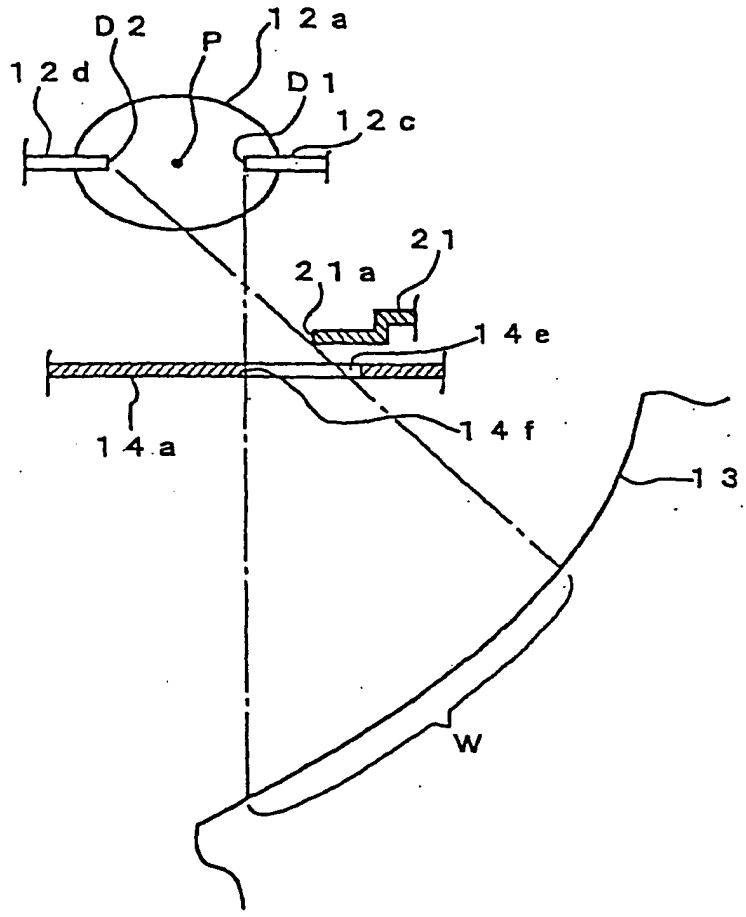


FIG.7



(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 195 552 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
10.04.2002 Bulletin 2002/15

(51) Int Cl.[7]: **F21S 8/10**, F21V 14/08
// F21W101:10

(21) Application number: **01122318.7**

(22) Date of filing: **18.09.2001**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **06.10.2000 JP 2000307933**
11.05.2001 JP 2001142072
11.05.2001 JP 2001142080
18.05.2001 JP 2001149414

(71) Applicant: **Stanley Electric Co., Ltd.**
Meguro-ku Tokyo (JP)

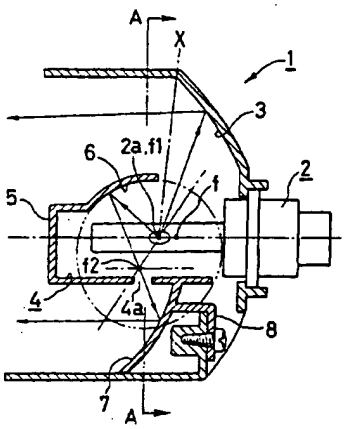
(72) Inventor: **Taniuchi, Hitoshi,**
c/o Stanley Electric Co., Ltd.
Tokyo (JP)

(74) Representative: **Müller, Hans-Jürgen, Dipl.-Ing.**
Müller, Schupfner & Gauger
Postfach 10 11 61
80085 München (DE)

(54) Headlamp

(57) In order to solve the problems in a headlamp which a prior discharge lamp or the like is provided as a light source, a headlamp in which a right elliptic reflecting surface and a left elliptic reflecting surface are provided on a position toward the front upper of the bulb, a right parabolic reflecting surface is provided on a position toward the lower and right of said main reflecting surface, and a left parabolic reflecting surface is provided on a position toward the lower and left of said main reflecting surface, whereby the light except for the light traveling in an upward direction from the bulb 2 and toward the main reflecting surface can be recovered and to convert into the light which can be used as the irradiating light; a headlamp in which the elliptic reflecting surfaces 6 which captures light emitted upwardly and forwardly from the bulb 2 and parabolic reflecting surfaces 7 which reflect said light to an irradiating direction and are provided on positions which an optical interference with said main reflecting surface 3 is caused are provided, and a light-distribution varying means 10 is provided in the optical path of the parabolic reflecting surfaces, whereby it becomes possible to switch between the light distributions even in the case of using the light source of only one; a headlamp in which the right_and left elliptic reflecting surfaces 6 are provided on a position toward the front upper of the bulb, and the lower reflecting surfaces of the left and right are provided on a position toward the lower of the left and right of the main reflecting surface 3, whereby the utilization factor of luminous flux is improved; and a headlamp in which the main reflecting surface 3a is provided as the upper half portion thereof, auxiliary reflecting surfaces 3b are provided on the left and right of the main reflecting surface 3a, the elliptic reflecting surfaces 6 are provided on the front upper of the light source 2 in the left and right direction, the parabolic reflecting surfaces 7 are provided on the lower of the main reflecting surface 3a, and a movable shield plate 18 is provided on the vicinity of the light source is constituted, whereby the light which heretofore has been used, said light being radiated in an upward direction from the bulb and toward the front is captured by the elliptic reflecting surfaces, and an amount of light is increased; are realized.

Fig. 1



EP 1 195 552 A2

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This invention relates to a lamp for a vehicle and more particularly constitution of the lamp for the vehicle such as a headlamp and a fog lamp used for (the purpose of) illuminating, and the object of the invention is to provide the constitution capable of improving an utilization factor of luminous flux for a light source and allowing a light-distribution characteristic to be variable. Moreover, this invention relates to a headlamp which is installed on the vehicle and more particularly to constitution of the headlamp in which a light distribution for a low beam is made it possible to switch from and/or to a light distribution for an upper beam using a light source such as a metal halide discharge lamp which does not have both of a filament for a low beam and the filament for the upper beam, for example.

2. Detailed Description of the Prior Art

[0002] A prior constitution of a headlamp 90 of this type represented as an example in the case where a light source 91 is a metal halide discharge lamp or the like and the headlamp 90 is a exclusive-light distribution for a low beam is shown in Fig. 22, and Fig. 23, and a parabolic-reflecting surface 92 formed into a paraboloid of revolution or the like having a focus "f" in a rearward position is provided with respect to an arc 91a of said light source 91.

[0003] According to this constitution, since an downward light beam would be generated from a upper half portion of the parabolic-reflecting surface 92, and an upward light beam from a lower half portion, said light source 91 (the arc 91a) is provided with a shield plate 93 on the lower, thereby light to be shielded so as to not reach the lower half portion of the parabolic-reflecting surface 92. Moreover, said light source 91 also is provided with a stripe 91b by black opaque paint or the like and the stripe 91b serves a part of functions of said shield plate 93. In addition, said shield plate 93 is provided with a shade shielding a direct light.

[0004] According to this constitution, the light comes to reach only the upper half portion of said parabolic-reflecting surface 92, that is, most of the light becomes the downward light beam, and the light distribution for the low beam can be obtained as shown in Fig. 23. Moreover, the portion which the light of a part of the lower half portion of the parabolic-reflecting surface 92 reaches is a portion for forming a light distribution referred to as an elbow, which illuminates the side of the roadside zone with an appropriate upper light beam in order to facilitate to recognize visually a road sign or the like installed on a roadside zone in Fig. 23.

[0005] Moreover, the prior headlamp 90 having the constitution of the headlamp in which the light distribution for the low beam is made possible to switch from and/or to the light distribution for the upper beam using the light source which does not have both of a filament for a low beam and the filament for the upper beam is shown in Fig. 24 to Fig. 25, and the light source 91 are provided with the shade 92 for preventing for the direct light from this light source 91 from irradiating the portion other than the headlamp 90 and to become a glare light, as well as a movable shield plate 93 which can be set at two positions by a driving device 96 such as a solenoid, for example.

[0006] Moreover, the central portion of a reflecting mirror 94 provided in the rearward position of said light source 91 is formed into a main reflecting portion 94a, the upper thereof is formed into an auxiliary reflecting portion 94b, and the side surfaces of the right and left thereof is formed into an auxiliary reflecting portion 94c as shown in the drawings. Moreover, the lower is provided with a shield plate 95 since the light colored with yellow or the like would be irradiated when said light source 91 is the metal halide discharge lamp, and the reflecting mirror 94 can not be provided on the lower of the light source 91 with exception of a part required for forming the light distribution.

[0007] Moreover, said main reflecting portion 94a is formed into the paraboloid of revolution or the like having a focus in appropriate front of the light source 91, whereby the downward reflected-light is generated, and said auxiliary reflecting portion 94b and the auxiliary reflecting portion 94c are formed into the paraboloid of revolution or the like which has a focus at the light source 91, whereby the reflected light traveling in the horizontal direction is generated.

[0008] Moreover, said movable shield plate 93 shields the portion which would reach said auxiliary reflecting portion 94b and auxiliary reflecting portion 94c, of the light from the light source when the driving device 96 is not operated, whereas the movable shield plate 93 allows the light to launch into the entire surface of the reflecting mirror 94, that is, both of the main reflecting portion 94a and the auxiliary reflecting portion 94b, 94c when the driving device 96 is operated.

[0009] According to this constitution, the light distribution of the headlamp 90 is constituted by only the downward light from the main reflecting portion 94a as shown by a light distribution "S" in Fig. 26 when the driving device 96 is not operated, that is, becomes the light distribution for the low beam. A light distribution H1 to the horizontal direction from the auxiliary reflecting portion 94b and a light distribution H2 from the auxiliary reflecting portion 94c are added to the light distribution "S" when the driving device 96 is operated, and the light distribution for the upper beam can be obtained by synthesizing the light distribution "S", the light distribution H1 and the light distribution H2.

[0010] Moreover, at this point of time, said light distribution H1 is formed so as to illuminate the front of the

vehicle like as a spot by the auxiliary reflecting portion 94b provided on the upper of the main reflecting portion 94a that a reflection image of the light source 91 is elongated in the vertical direction, on the other hand, the light distribution H2 is formed so as to illuminate the right and left of the traveling direction of the vehicle widely by the auxiliary reflecting portion 94c provided on the sides of the right and left of the main reflecting portion 94a that the reflection image of the light source 91 is elongated in the horizontal direction.

[0011] However, the utilization factor of luminous flux with respect to the light source 91 has been essentially low in the headlamp 90 according to the prior constitution described above, since only a substantial half of the parabolic-reflecting surface 92 is utilized in order to obtain the light distribution for the low beam. In addition thereto, there has been a problem in recent years that requirements or the like reducing a dimension of the up-and-down direction is increased for example, and it leads to reduction in square measure of said parabolic-reflecting surface 92, so that lack of illuminance of the headlamp 90 becomes noticeable increasingly due to the recognition that the headlamp 90 also supports a part of design of the vehicle. Moreover, there has been a problem in the headlamp 90 according to the prior constitution described above that the reflecting mirror 94 is compartmentalized into the main reflecting portion 94a and the auxiliary reflecting portion 94b, and the light distribution for the low beam used in most situation of the case of usual driving becomes dark since the auxiliary reflecting portion 94b is covered from the light source 91 in the case of the light distribution for the low beam.

SUMMARY OF THE INVENTION

[0012] This invention solves the problems by providing:

a headlamp constituted by providing on a substantial upper half portion a main reflecting surface formed into a parabolic surface providing a light-emitting source of a bulb as a substantial focus, wherein a right elliptic reflecting surface and a left elliptic reflecting surface providing the vicinity of a light-emitting source of a bulb as a primary focus respectively are provided on a position toward the front upper of the bulb in the form of being connected substantial along a center line of this headlamp, a second focus of said right elliptic reflecting surface being provided on the appropriate right side of said bulb, a second focus of said left elliptic reflecting surface being provided on the appropriate left side of said bulb, a right parabolic reflecting surface providing the second focus of said right elliptic reflecting surface as a focus is provided on a position toward the lower and right of said main reflecting surface, and a left parabolic reflecting surface providing the second focus of said left elliptic reflecting surface as a focus is provided on a position toward the lower and left of said main reflecting surface;

a headlamp constituted by providing on a substantial upper half portion a main reflecting surface formed into a parabolic surface providing a light-emitting source of a bulb as a substantial focus, wherein a right elliptic reflecting surface and a left elliptic reflecting surface providing the vicinity of a light-emitting source of a bulb as a primary focus respectively are provided on a position toward the front upper of the bulb in the form of being connected substantially along a center line of this headlamp, a second focus of said right elliptic reflecting surface being provided on the appropriate right side of said bulb, a second focus of said left elliptic reflecting surface being provided on the appropriate left side of said bulb, a right parabolic reflecting surface providing the second focus of said right elliptic reflecting surface as a focus is provided on a position toward the lower and right of said main reflecting surface, and a left parabolic reflecting surface providing the second focus of said left elliptic reflecting surface as a focus is provided on a position toward the lower and left of said main reflecting surface, and optical paths of the reflected light from said right parabolic reflecting surface and left parabolic reflecting surface are designed to be substantially parallel each other, or to intersect each other at front of the headlamp, as well as at least a part of the optical paths from said two parabolic reflecting surfaces is provided with a light-distribution varying means constituted by reflecting means or refracting means;

a headlamp constituted by providing on a substantial upper half portion a main reflecting surface formed into a parabolic surface providing a light-emitting source of a bulb as a substantial focus, wherein a right elliptic reflecting surface and a left elliptic reflecting surface providing the vicinity of a light-emitting source of a bulb as a primary focus respectively and each is formed into at least one piece are provided on a position toward the front upper of the bulb in the form of being connected substantially along a center line of this headlamp, a second focus of said right elliptic reflecting surface being provided on the appropriate right side of said bulb, a second focus of said left elliptic reflecting surface being provided on the appropriate left side of said bulb, at least a lower right reflecting surface which an ellipsoid providing the second focus of said right elliptic reflecting surface as a primary focus appears on a horizontal section on a position toward the lower and left of said main reflecting surface, and at least a lower left reflecting surface which the ellipsoid providing the second focus of said left elliptic reflecting surface as the primary focus appears on the horizontal section on the position toward the lower and right of said main reflect-

ing surface; and
a headlamp constituted by providing on a substantial upper half portion a main reflecting portion which is formed into a parabolic surface providing a light-emitting source as a substantial focus and forms a light distribution for the low beam, wherein the right and left of said main reflecting portion are provided with an auxiliary reflecting portion providing an irradiating direction as the front, and the front upper of said light source is provided with two elliptic reflecting surfaces providing said light source as a primary focus in a manner to stand face to face each other, and a second focus of these elliptic reflecting surfaces is provided at the vicinity of a side direction of said light source of the side in which the respective elliptic reflecting surface exists, and providing the second focus of said respective elliptic reflecting surface as a focus and a parabolic reflecting surface providing the irradiating direction as the front is provided on the lower of said main reflecting portion respectively, as well as the vicinity of said light source is provided with a movable shield plate, whereby light which is incident on said auxiliary reflecting portion from said light source and light which is incident on the parabolic reflecting surface from said elliptic reflecting surface can be designed to pass through and to be shielded; as specified means for solving the prior problems described above.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013]

Fig. 1 is a front elevation showing a first embodiment of a headlamp according to the invention.
Fig. 2 is a sectional view along line A-A in Fig.1
Fig. 3 is a perspective view showing a second embodiment of the headlamp according to the invention, the view being shown by component parts.
Fig. 4 is a perspective view showing a third embodiment of a headlamp according to the invention.
Fig. 5 is an illustration showing a condition, at the time when being not operated, of a third embodiment of a headlamp according to the invention, the illustration being shown by component parts.
Fig. 6 is an illustration showing a condition of a light distribution at the time when being not operated.
Fig. 7 is an illustration showing a condition, at the time when being operated, of a third embodiment of a headlamp according to the invention, the illustration being shown by component parts.
Fig. 8 is an illustration showing a condition of a light distribution at the time when being operated.
Fig. 9 is a perspective view showing a fourth embodiment of a headlamp according to the invention.
Fig. 10 is an illustration showing a condition of a light distribution obtained by the fourth embodiment.
Fig. 11 is a perspective view showing a fifth embodiment of a headlamp according to the invention.
Fig. 12 is a perspective view showing component parts of the fifth embodiment of a headlamp according to the invention.
Fig. 13 is an illustration showing a condition of a light distribution obtained by the fifth embodiment.
Fig. 14 is a perspective view showing a sixth embodiment of a headlamp according to the invention.
Fig. 15 is a sectional view along line B-B in Fig.14.
Fig. 16 is an illustration showing a condition of a light distribution obtained by the sixth embodiment.
Fig. 17 is a perspective view showing a seventh embodiment of a headlamp according to the invention.
Fig. 18 is a sectional view along line A-A in Fig.17.
Fig. 19 is a sectional view along line B-B in Fig.17.
Fig. 20 is an illustration showing an operating condition of a movable shield plate.
Fig. 21 is a perspective view showing component parts of the seventh embodiment of the headlamp according to the invention, the component parts being shown in the decomposed condition.
Fig. 22 is a sectional view showing a prior example.
Fig. 23 is an illustration showing a reaching condition of light from a light source to a reflecting surface in the same prior example.
Fig. 24 is a front elevation showing the prior example.
Fig. 25 is a sectional view along line C-C in Fig. 24.
Fig. 26 is an illustration showing a method for switching the light distribution of a variable light-distribution headlamp of this type.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0014] Next, the invention will be described in detail based on embodiments shown in drawings. Fig. 1 and Fig. 2 shows a basic constitution with exception of a part of a light-distribution varying means 10 for a headlamp 1 according to the invention, and although said headlamp 1 will be described, assuming that a bulb 2 of a discharge lamp such as a metal halide discharge lamp is provided as a light source, for example, in this first embodiment, it is needless to say that the same constitution also can be applied to an incandescent lamp such as a halogen lamp.

[0015] Moreover, although it is the same as a prior example in the point that the headlamp 1 also is provided with a main reflecting surface 3 formed into the parabolic reflecting surface or the like which a focus "f" is set at the rear of a arc 2a of the light source of said bulb 2, the main reflecting surface 3 is formed with only the upper half portion including the lower half portion of a part forming an elbow described in the prior example in this invention.

[0016] Moreover, although it is the same as prior examples in the point that a shield plate 4 for forming a

light distribution for the low beam is provided together with stripes (not shown) provided on the bulb 2, covering the lower of said bulb 2, this shield plate 4 is provided with an opening 4a with an appropriate external diameter which will be described in detail below on an appropriate position.

[0017] In addition, although a shade 5 for preventing for direct light being radiated to an exterior to cause a glare to a driver of an on-coming vehicle is provided on the front of the light source 2, a pair of elliptic reflecting surfaces 6 formed into an ellipsoid of revolution providing said arc 2a as the primary focus f1, that is, a right elliptic reflecting surface 6R and a left elliptic reflecting surface 6L are provided on a part of said shade 5 according to the invention. Moreover, the right and left is referred with respect to the condition at viewing the headlamp 1 from the front in this description.

[0018] At this point, describing a constitution of said elliptic reflecting surfaces 6R and 6L, first, a primary focus f1 of the right elliptic reflecting surface 6R of one hand of a pair elliptic reflecting surfaces is positioned at the arc 2a, and the secondary focus f2 thereof is positioned at the appropriate right side of said bulb as shown in Fig. 2. Therefore, a major axis Zr of this right elliptic reflecting surface 6R rises toward the left in the condition viewing the headlamp 1 from the front.

[0019] Moreover, the left elliptic reflecting surface 6L of the other of a pair is formed in a manner to position the primary focus f1 at the arc 2a, as well as to position the primary focus f2 at the left of said bulb 2 appropriately, and the major axis Zl thereof rises toward the left. At this point, since both the elliptic reflecting surfaces 6 (R, L) are formed into the same shape basically, these are coupled each other along the center line of the headlamp 1 vertically.

[0020] Moreover, the end of the position toward said main reflecting surface of both the elliptic reflecting surfaces 6 (R, L) is formed so as to come to the vicinity of a line X connecting a substantial center of said arc 2a and the outside end of the main reflecting surface 3 as shown in Fig. 1, whereby luminous flux which is radiated toward the outside end of the main reflecting surface 3 from said arc 2a is designed to be not shielded.

[0021] Moreover, a right parabolic reflecting surface 7R which this secondary focus f2 is provided as a focus and is formed into paraboloid of revolution or the like, and which has the substantially same optical axis as the irradiating direction of the headlamp 1 is provided, corresponding to the secondary focus f2 of the right elliptic reflecting surface 6R, and a left parabolic reflecting surface 7L which has the same constitution as the right parabolic reflecting surface 7R and which this secondary focus f2 is provided as a focus f2 is provided, corresponding to the secondary focus f2 of the left elliptic reflecting surface 6L.

[0022] In this case, in this invention, since only the substantial upper half portion of said main reflecting surface 3 is provided as also described above, it is provided corresponding to the position of the lower half portion omitted, whereby an optical interference with said main reflecting surface 3 is designed to not cause.

[0023] Here, discussing an optical path from the elliptic reflecting surfaces 6 (R, L) to the parabolic reflecting surfaces 7 (R, L) in detail, a shield plate 4 exists therebetween. Accordingly, what is provided is said opening 4a, and it is provided in order to secure the optical path for light reflecting from said elliptic reflecting surfaces 6 (R, L) to reach the parabolic reflecting surfaces 7 (R, L).

[0024] Moreover, there has been the possibility that function as the shield plate 4 is detracted, since said opening 4a is provided and direct light from the arc 2a also leaks from this opening 4a. Accordingly, it is assumed that the secondary focus f2 exists in the vicinity of said shield plate 4 when setting the shape of the elliptic reflecting surfaces 6 (R, L).

[0025] Or reversely, assuming that said shield plate 4 exists in the vicinity of the secondary focus f2 when setting the shape of the shield plate 4, the secondary focus f2 is positioned at the position on which reflected light from the elliptic reflecting surfaces 6 (R, L) converges, whereby a bore of the opening 4a can be made small and influence of leakage light can be minimized.

[0026] According to the described-above constitution, the head lamp 1 according to this invention is provided in a manner that said elliptical reflective surfaces 6 (R, L) covers the valve 2 from the upper front, whereby the elliptic reflecting surfaces 6 (R, L) can capture light which can not be captured by the main reflecting surface 3 and has the direction having the possibility which becomes direct light, that is, luminous flux from the valve 2 which heretofore has been invalid to launch it on the parabolic reflecting surfaces 7 (R, L) and to allow it to use as irradiation light of head lamp 1.

[0027] Moreover, since said elliptical reflective surfaces 6 (R, L) is established so as to capture light of the range which the main reflective surface 3 can not capture, when the captured amount of luminous flux is decreased by miniaturizing the main reflective surface 3, for example, it also becomes possible to supply it by the elliptical reflective surfaces 6 (R, L), whereby light of a level required for the headlamp 1 can be secured. Moreover, a reference numeral 10 in drawings shows a light-distribution varying means which will be described in detail hereinafter.

[0028] Fig. 3 shows further embodiment of the headlamp 1 according to this invention, and this embodiment is a specified constitution according to the elliptic reflecting surfaces 6 (R, L) and the parabolic reflecting surfaces 7 (R, L). A considerably high accuracy is required for each of a combination of the right elliptic reflecting surface 6R and the right parabolic reflecting surface 7R and a combination of the left elliptic reflecting surface 6L and the left parabolic reflecting surface 7L in a mutual relationship when providing the described-above constitution, when constituted as described above. Moreover, an installation accuracy consistent therewith also is re-

quired for the bulb 2.

[0029] Accordingly, according to the invention, said elliptic reflecting surfaces 6 (R, L) and parabolic reflecting surfaces 7 (R, L) are formed by integrally molding with a mold, including the shield plate 4 and the shade 5, and in this case, basically, an installation section 8 on said main reflective surface 3 is provided in advance such as an installation position with the bulb 2 to be installed on the main reflecting surface 3 comes to the predetermined position.

[0030] Since only the upper half portion of the main reflecting surface 3 is used, when this headlamp 1 is to form the light distribution for the low beam as is described above, said installation section 8 may be formed on the lower half portion of the main reflecting surface 3 by engaging with a screw 9 or the like.

[0031] At this point,, the light directed downwardly can not be used substantially for the headlamp 1 in which is required to be monochromic in color of light, since the light slightly colored yellowly is emitted downwardly due to precipitation of a metal halide substance when the light source is the valve 2 of the metal halide discharge lamp in particular, and therefore, it is reasonable means for recovering the light which is emitted upwardly except for the light which reaches the main reflecting surface 3 through two elliptic reflecting surfaces 6 (R, L) according to the invention.

[0032] Moreover, since the lower half portion of the main reflective surface 3 is the portion which can not be used substantially because of the same reason as described above when in addition, the light source is the valve 2 of the metal halide discharge lamp, it can not be caused completely an inconvenience due to installing moldings obtained by integrally molding said elliptic reflecting surfaces 6 (R, L), parabolic reflecting surfaces 7 (R, L), shield plate 4 and shade 5 on the lower half portion of the main reflective surface 3.

[0033] Fig. 4 shows a third embodiment where building a light-distribution varying means 10 in a basic constitution described above to constitute said headlamp 1 as a variable light-distribution type and, in this first embodiment, the light-distribution varying means 10 is constituted by a rotary mirror 11 turned by a motor 12 or the like interlocking with a steering operation, for example, and is exists in the optical path from the parabolic reflecting surfaces 7 (R, L) always.

[0034] Moreover, it is effective that luminous flux from the parabolic reflecting surfaces 7 (R, L) is designed to intersect each other at the vicinity of the rotary mirror 11 in advance so as to launch light into the rotary mirror 11 sufficiently, since the light from said parabolic reflecting surfaces 7 (R, L) is incident on the rotary mirror 11 sufficiently to set an angle of the rotary mirror 11 at reflecting or the like, whereby characteristic is changed in this case.

[0035] Moreover, although the third embodiment will be described, assuming that both of a frontal surface 11a and a rear surface 11b of said rotary mirror 11 are finished into mirror surfaces, appropriate projections and depressions may be provided freely for the purpose of diffusing the light after reflecting in the horizontal direction, or the mirror may be formed into a curved surface freely along the traveling direction of the light of the parabolic reflecting surfaces 7 (R, L), for example.

[0036] Moreover, the main reflecting surface and the right elliptic reflecting surface are in proper alignment that the amount of recovery can be increased by enlarging the left and right elliptic reflecting surfaces in dimension when the main reflecting surface is miniaturized, and the headlamp can be constituted without lots of loss in an entire amount of light of the headlamp even in the case that miniaturization in the main reflecting surface is required in particular, whereby flexibility in design also can be increased and extremely excellent effects can be performed for improvement in fine view.

[0037] Moreover, Fig. 5 to Fig. 8 show actions and effects of the third embodiment constituted as described above. First, the front surface 11a and the back surface 11b of said rotary mirror 11 are in parallel to the traveling direction of the vehicle when the steering is not operated as shown in Fig. 6. Therefore, the light from the parabolic reflecting surfaces 7 (R, L) is reflected by the front surface 11a and the rear surface 11b and to be radiated to the exterior in the condition that the directions are reversed, whereby a light distribution Hr and a light distribution Hl, as well as a light distribution Hm are formed by the light from the main reflecting surface 3, thereby the light distribution for the low beam to be formed, for example as shown in Fig. 6.

[0038] Moreover, the rotary mirror 11 also is turned toward a turning direction of the vehicle as shown in Fig. 7 when operating the steering in order to turn to the left, for example, and therefore, the light distribution Hr from the parabolic reflecting surface 7R and the light distribution Hl from the parabolic reflecting surface are shifted toward the left with respect to the light distribution Hm from the main reflecting surface 3 as shown in Fig. 8.

[0039] Fig. 9 shows a fourth embodiment according to the invention. The rotary mirror 11 of reflecting means exists in the optical path from the parabolic reflecting surfaces 7 (R, L) always, and the direction of light is changed by rotating the mirror as required in the previous fourth embodiment. In contrast with this, said reflecting means is a movable mirror 13 which enters into or exits from the optical path from said parabolic reflecting surfaces 7 (R, L) as required in this fourth embodiment. Moreover, this fourth embodiment will be described, assuming that the light from said parabolic reflecting surfaces 7 (R, L) is parallel light traveling toward a frontal direction of the headlamp 1.

[0040] Moreover, said movable mirror 13 is formed into a substantial wedged shape forming the valve 2 (light source) sides into a top in this fourth embodiment. However, it also may be the constitution that the wedge-shape bodies different in an angle of said top described above are stacked, or the constitution that the top be-

comes large successively as advancing downwardly as required, from a viewpoint of forming a light distribution characteristic.

[0041] The movable mirror 13 formed as described above enters into or exits from the optical path from said parabolic reflecting surfaces 7 (R, L) so as to be inserted at low-speed driving and to leave at high-speed driving corresponding to a speed of a vehicle, for example.

[0042] According to this constitution described above, the light from the parabolic reflecting surfaces 7 (R, L) can be located within the light distribution Hm from said main reflecting surface 3, and forms the light distribution Hh for high-speed driving irradiating as a spot a frontal road surface of the traveling direction of the vehicle at high-speed driving, and is split into the left and right by the movable mirror 13 and to form two light distributions for low-speed driving irradiating the left and right direction of the vehicle widely at low-speed driving in a city area or the like as shown in Fig. 10.

[0043] Fig. 11 shows a fifth embodiment according to the invention. Although both the light-distribution varying means 10 of the first and fourth embodiments have been constituted by the reflecting means such as the rotary mirror 11 and the movable mirror 13, the present invention should be limited thereto and refracting means such as lens also may be used.

[0044] On the one hand, said light-distribution varying means 10 is replaced with a movable lens 14 which enters into or exits from the optical path from the parabolic reflecting surfaces 7 (R, L) by the same mechanism as the fourth embodiment described above by operating of a driver, and is formed into a cylindrically-shaped lens having an axis of the up-and-down direction, for example in this fifth embodiment.

[0045] Moreover, this fifth embodiment will be described, assuming that the light from said parabolic reflecting surfaces 7 (R, L) is parallel light traveling toward a frontal direction of the headlamp 1.

[0046] At this point, in this fifth embodiment, said movable lens 14 is formed into a shape which a substantial arc of which curvature becomes large increasingly appears on a cross section of the horizontal direction, and is formed into a shape which a prism shape increasing the degree that light is refracted downwardly appears on a cross section of the vertical direction as shown in Fig. 12. And then, said movable lens 14 is inserted into luminous flux from said parabolic reflecting surfaces 7 (R, L) at city-area driving. Moreover, said movable lens 14 is designed to exit from luminous flux from the parabolic reflecting surfaces 7 (R, L) by operating a switch or the like, when the necessity is recognized by the driver at suburb driving, or at driving on an express way and so forth.

[0047] Fig. 13 is an illustration showing a condition of a light distribution in the fifth embodiment constituted as described above. First, when the movable lens 14 is inserted at city-area driving, the light from said parabolic reflecting surfaces 7(R, L) is diffused to the left and right, as well as is refracted downwardly, and a light distribution Hp irradiating the front of the vehicle widely with the downward light can be obtained.

[0048] At this point of time, since the light from the main reflecting surface 3 forms the light distribution for the low beam Hm, the function as the light distribution for the low beam can not be lost even when the light Hp from the parabolic reflecting surfaces 7 (R, L) which is downward and wide in the horizontal direction is added thereto, whereby the intensity in light is increased more and more by the addition of the light described above, and improvement in visibility or the like can be obtained.

[0049] At this point, said movable lens 14 initiates to exit from luminous flux from the parabolic reflecting surfaces 7 (R, L) when the driver performs the steering operation in order to enter the express way, for example, and the light from the parabolic reflecting surfaces 7 (R, L) and in response thereto, irradiation toward the horizontal direction is limited in width increasingly, as well as the irradiating direction is changed from downward to the horizontal direction, and the light distribution Hu irradiating the front of the vehicle as the spot is formed at the time when the exit is completed, whereby it becomes possible to switch between the light distribution for the low beam and the light distribution for the upper beam.

[0050] Moreover, a lower right reflecting surface 7LR is provided, corresponding to the secondary focus f2 of the right elliptic reflecting surface 6R, and a lower left reflecting surface 7LL is provided corresponding to the secondary focus f2 of the left elliptic reflecting surface 6L. At this point of time, said lower right reflecting surface 7LR and lower left reflecting surface 7LL are designed such that the ellipsoid providing the second focus of said elliptic reflecting surfaces 6 as a primary focus appears on at least the cross section of the horizontal direction (in the condition mounted on the vehicle, and similarly to the vertical direction) in this invention.

[0051] Said lower reflecting surfaces 7 (RR, LL) further will be described in detail. These lower reflecting surfaces 7 (RR, LL) are such formed that a parabola providing the second focus of said elliptic reflecting surfaces 6 (R, L) as a focus appears on the cross section to the vertical direction, for example, and diffuse after converging once in the horizontal direction to radiate luminous flux which will become a parallel light beam in the vertical direction by the ellipsoid given on said cross section of the horizontal direction in conjunction therewith. And then, the major axis of said ellipse is directed toward the front of the vehicle in this third embodiment

[0052] Moreover, said lower right reflecting surface 7LR and lower left reflecting surface 7LL are provided corresponding to the position of the lower half portion omitted since only the upper half portion of the main reflecting surface 3 is used, whereby an optical interference with said main reflecting surface 3 is designed to not cause as described above. Moreover, according to the invention, the shield plate 4, the shade 5, said right

elliptic reflecting surface 6R and the lower reflecting surfaces 7 (RR, LL) are integrally molded by resin members, for example, and are formed integrally with the main reflecting surface 3 by the installation section 8 as shown in Fig. 1.

[0053] At this point, discussing the optical path from the elliptic reflecting surfaces 6 (R, L) to lower reflecting surfaces 7 (RR, LL) in detail, the shield plate 4 exists therebetween, so the optical path is shielded. Accordingly, the opening 4a is provided in order to secure the optical path for the light, which reflects on the elliptic reflecting surfaces 6 (R, L) to reach lower reflecting surfaces 7 (RR, LL).

[0054] Moreover, since said opening 4a is provided, a direct light from the arc 2a also leaks from this opening 4a, it would be caused the possibility that function as the shield plate 4 is detracted. Accordingly, the secondary focus f2 should be in the vicinity of said shield plate 4 when setting the shape of the elliptic reflecting surfaces 6 (R, L).

[0055] Or, assuming that said shield plate 4 exists in the vicinity of the secondary focus f2 when setting the shape of the shield plate 4, the secondary focus f2 is positioned at the position on which reflected light from the elliptic reflecting surfaces 6 (R, L) converges, whereby a bore of the opening 4a can be made small and influence of leakage light can be minimized. Further speaking, leakage light can be minimized more and more when the bore of the opening 4a is formed small, as well as providing at the position which becomes a shadow of the stripe described in the prior examples.

[0056] According to the constitution described above, the headlamp 1 captures the light which is radiated toward the front upper from the arc 2a which is shielded by the shade or the like and, heretofore, could not be used by said elliptic reflecting surfaces 6 (R, L) and to project it toward the irradiating direction by the lower reflecting surfaces 7 (RR, LL), whereby the capture factor of luminous flux is improved and the headlamp 1 increased in intensity in light can be realized.

[0057] Fig. 14 to 17 show sixth embodiment of the headlamp 1 according to this invention. In this second embodiment, the major the axes Xz of said lower reflecting surfaces 7 (RR, LL) are inclined toward the right side for the headlamp 1 to be inserted on the right side of the vehicle, and the major axes Xz thereof are inclined toward the left side (in the condition as illustrated) for the headlamp 1 to be inserted on the left side of the vehicle (not shown).

[0058] Moreover, a refracting means15 which is formed into a shape as obtained by cutting out only a half of one hand from a center axis of a cylindrical plano-convex lens and to combine them and has a refracting action to one direction and a converging action is provided on the front of said lower reflecting surfaces 7 (RR, LL), for example, and this refracting means 15 is designed to enter into or exit from the optical path of the lower reflecting surfaces 7 (RR, LL) freely by a motor 16 or the like, for example.

[0059] At this point of time, since the major axis Xz of said refracting means15 is inclined when the light reflected by said lower reflecting surfaces 7 (RR, LL) transmits the refracting means15, said refracting means15 is set such that the lower reflecting surfaces 7 (RR, LL) of the headlamp 1 installed on the right side of the vehicle, for example, refract the light traveling toward the left which is produced toward the front direction of the vehicle, as well as converge an angle at which the light reflected by said lower reflecting surfaces 7 (RR, LL) is diffused by the ellipsoid set in the horizontal cross section to a smaller diffusion angle.

[0060] In addition, said refracting means15 is designed to hold the condition of being inserted in luminous flux from the lower reflecting surfaces 7 (RR, LL) when the steering is not operated, only the refracting means15 of the headlamp 1 of the right side is designed to exit from in luminous flux from the lower reflecting surfaces 7 (RR, LL) when the steering is not operated to turn to the right, and only the refracting means15 of the headlamp 1 of the left side is designed to exit from in luminous flux from the lower reflecting surfaces 7 (RR, LL) when the steering is not operated to turn to the left.

[0061] Fig. 16 shows a light distribution characteristic H2 of a sixth embodiment constituted as described. First, said refracting means10 is inserted into luminous flux from the lower reflecting surfaces 7 (RR, LL) in the headlamp 1 installed on the right side of the vehicle and in the headlamp 1 installed on the left side of the vehicle, in the condition that the vehicle drives straight ahead, that is, the steering is not operated to turn to the right. Therefore, the light from the lower reflecting surfaces 7 (RR, LL) is projected as a light distribution Ht with the narrow diffusion angle in the front direction of the vehicle and to be added to the light distribution for the low beam Hm from the main reflecting surface 3 and to irradiate the road surface of the front direction brightly.

[0062] At this point, only the refracting means15 of the headlamp 1 of the right side exits from in luminous flux from the lower reflecting surfaces 7 (RR, LL) and is directed to the right direction and to produce the widely-diffusing light distribution Hr and to irradiate the right direction of the front of the vehicle widely when the steering is not operated to turn to the right, for example, whereby the light distribution adaptable to turning to the right can be obtained in conjunction with the light distribution Hm from the main reflecting surface 3. In the same manner, the light distribution adaptable to turning to the left can be obtained by the light distribution from the headlamp 1 of the left side, when the steering is operated to turn to the left. Next, the invention will be described in detail based on embodiments shown in drawings. Referring to Fig. 17 to Fig. 18, a reference numeral 1 shows the headlamp of a seventh according to the invention. This headlamp 1 is provided with a light source 2, a reflector 3, a shield plate 4 and a shade 5 as is described above in the same manner.

[0063] At this point, according to the invention, a pair of elliptic reflecting surfaces 6 (R, L) formed integrally with said shade 5 is provided in bilateral symmetry with respect to an optical axis X, which each of said elliptic reflecting surfaces 6 takes the light source 2 as a primary focus f1. And then, the position at which this elliptic reflecting surface 6 is provided is the front and upper of said light source 2, and it is a range which cannot reach said reflector 3, that is, the portion which heretofore, have been shielded by the shade.

[0064] Moreover, it may be formed integrally on said shade 5 a stay 19 for coupling to the reflector 3 the constitution obtained by integrally forming the shield plate 4 shielding the colored light which is radiated downwardly from the light source 2 and these elliptic reflecting surfaces 6, the parabolic reflecting surfaces 7 (R, L), the shield plate 4 and the movable shield plate 18 or the like, as well as the elliptic reflecting surfaces 6 (R, L) described above and the parabolic reflecting surfaces 7 (R, L) which will be described below.

[0065] The secondary focus f2 of said respective elliptic reflecting surface 6 is provided on the side on which each is provided as is the substantially left side of the light source 2 in the case of the left elliptic reflecting surface 6L which said elliptic reflecting surface 6 is provided on the left side of the light source 2, or the substantially right side of the light source 2 in the case of the right elliptic reflecting surface 6R, and in addition, the parabolic reflecting surfaces 7 (R, L) with a horizontal-reflecting direction is provided on the lower of said reflector 3 by forming the paraboloid of revolution providing the secondary focus f2 of said respective elliptic reflecting surfaces 6 (R, L) as a focus.

[0066] Moreover, although it is the same in the point that a main reflecting surface 3a for forming the light distribution for the low beam on said reflector 3 and an auxiliary reflecting surface 3b for forming the light distribution for the upper beam are provided also in the headlamp 1, the auxiliary reflecting surfaces 3b are provided only on the sides of the left and right of the main reflecting surface 3a as also shown in Fig. 18, differing from the prior art, according to the invention.

[0067] In addition, although the movable shield plate 18 which is moved between two predetermined positions by a driving device D such as a solenoid is provided also in the headlamp 1 according to the invention, this movable shield plate 18 is constituted by a side shielding section 18a shielding for the light from the light source 2 reaching the auxiliary reflecting surfaces 3b provided on the sides of the left and right of the main reflecting surface 3a when being not moved by the driving device D and a lower shielding section 18b shielding the optical path that the light from the light source 2 reflects at said elliptic reflecting surface 6 and to direct to the parabolic reflecting surface 7, and is installed on the shade 5 by the shaft 18c so as to turn freely as also shown in Fig. 21, for example.

[0068] And then, it exits from the optical path from the light source 2 to the auxiliary reflecting surface 3b and the optical path from the elliptic reflecting surface 6 to the parabolic reflecting surface 7 as shown in Fig. 20 when being moved by the driving device D, and the light is incident on these auxiliary reflecting surface 3b and the parabolic reflecting surface 7. Accordingly, the light irradiated to the front as the headlamp 1 can realize the light distribution for the upper beam by adding the light from the auxiliary reflecting surface 3b each being irradiated to the front direction and the light from the parabolic reflecting surface 7 to the light distribution for the low beam from the main reflecting surface 3a of the main reflecting surface 3 (refer also to Fig. 25).

[0069] Moreover, the light distribution (corresponds to the light distribution H2 in Fig. 26) for irradiating the left and right direction of the vehicle widely is formed by the auxiliary reflecting surfaces 3b provided on the sides of the left and right of the main reflecting surface 3a, and the light distribution (corresponds to the light distribution H1 in Fig. 26) for irradiating the front direction of the vehicle as a spot by the portion obtained by combining the elliptic reflecting surfaces 6 with the parabolic reflecting surface 7, also in the invention.

[0070] Subsequently, actions and effects of the headlamp 1 according to the invention constituted as described above will be described below. 104) First, the portion provided on the main reflecting surface 3a of the inside of the auxiliary reflecting surface 3b becomes unnecessary according to the invention, whereby an area of the main reflecting surface 3a is increased, so that the light distribution for the low beam used at all time becomes bright.

[0071] At this point, it appears that the area of the main reflecting surface 3a is made narrow since the auxiliary reflecting surfaces 3b is provided on the sides of the left and right of the main reflecting surface 3a still more, however, since there is a dimensional margin in the left and right direction of the vehicle body in many cases and it is possible to extend, the auxiliary reflecting surface 3b can be formed, extending the dimension, whereby light can not be lost in amount of light substantially.

[0072] Moreover, the elliptic reflecting surfaces 6 is designed to provide on the front and upper of said light source 2 and further to reflect the reflected light from this elliptic reflecting surface 6 to the front direction by the parabolic reflecting surface 7, thereby the auxiliary reflecting part provided on the upper of the main reflecting surface 3a in the prior examples to be replaced therewith, whereby the capture factor of luminous flux to the light source 2 can be improved as the entire headlamp 1 since said elliptic reflecting surface 6 recovers the light of the area which is shielded by the shade because of the portion by which the glare light is caused and heretofore can not be used and to convert into the irradiating light as described above.

[0073] The light distribution for the low beam used at all time is not only made bright, but also the light distri-

bution for the upper beam which are used when driving at high speed on the expressway and the suburbs or the like, for example, is made bright by this constitution, that is, a more bright headlamp 1 can be realized even using the light source 2 with the same intensity of light.

[0074] Moreover, since said movable shield plate 18 is constituted in the substantially same manner as the prior examples, including the driving device D, moreover, said elliptic reflecting surface 6 and parabolic reflecting surface 7 also are the shapes which can be formed with the shade 5 integrally, the cost of parts or the number of manpower is not increased as compared to the prior examples, whereby the actions and effects described above can be realized without increase in products cost.

[0075] As described above, according to the invention, a headlamp can be realized which is constituted by providing on a substantial upper half portion a main reflecting surface formed into a parabolic surface providing a light-emitting source of a bulb as a substantial focus, wherein a right elliptic reflecting surface and a left elliptic reflecting surface providing the vicinity of a light-emitting source of a bulb as a primary focus respectively are provided on a position toward the front upper of the bulb in the form of being connected substantially along a center line of this headlamp, a second focus of said right elliptic reflecting surface being provided on the appropriate right side of said bulb, a second focus of said left elliptic reflecting surface being provided on the appropriate left side of said bulb, a right parabolic reflecting surface providing the second focus of said right elliptic reflecting surface as a focus is provided on a position toward the lower and right of said main reflecting surface, and a left parabolic reflecting surface providing the second focus of said left elliptic reflecting surface as a focus is provided on a position toward the lower and left of said main reflecting surface, whereby the light except for the light traveling in an upward direction from the bulb 2 and toward the main reflecting surface can be recovered and to convert into the light which can be used as the irradiating light, and a problem can be solved that the utilization factor of luminous flux with respect to the light source 91 is low, which has been occurred in the headlamp of this type, and the extremely excellent effects can be performed for improvement in a performance of the headlamp.

[0076] Moreover, the headlamp can be realized that optical paths of the reflected light from said right parabolic reflecting surface and left parabolic reflecting surface are designed to be substantially parallel each other, or to intersect each other at front of the headlamp, as well as at least a part of the optical paths from said two parabolic reflecting surfaces is provided with a light-distribution varying means constituted by reflecting means or refracting means, whereby, first, said elliptic reflecting surfaces 6 recovers the light which is shielded by the shade or the like because of the cause by which the glare light is caused, and which heretofore can not be used, said light being radiated in an upward direction from the bulb and toward the front, and the light is converted into an usable light as the irradiating light by the parabolic reflecting surface, whereby the extremely excellent effects can be performed for improvement in performance of the headlamp of this type.

[0077] In addition, the headlamp can be realized which is constituted by providing on a substantial upper half portion a main reflecting surface formed into a parabolic surface providing a light-emitting source of a bulb as a substantial focus,

wherein a right elliptic reflecting surface and a left elliptic reflecting surface providing the vicinity of a light-emitting source of a bulb as a primary focus respectively and each is formed into at least one piece are provided on a position toward the front upper of the bulb in the form of being connected substantially along a center line of this headlamp, a second focus of said right elliptic reflecting surface being provided on the appropriate right side of said bulb, a second focus of said left elliptic reflecting surface being provided on the appropriate left side of said bulb, at least a reflecting surface of a lower right portion which an ellipsoid providing the second focus of said right elliptic reflecting surface as a primary focus appears on a horizontal section on a position toward the lower and left of said main reflecting surface, and at least a reflecting surface of a lower left portion which the ellipsoid providing the second focus of said left elliptic reflecting surface as the primary focus appears on the horizontal section on the position toward the lower and right of said main reflecting surface, whereby the light which heretofore can not be used, said light being radiated in an upward direction from the bulb and toward the front, also is converted into an usable light as the irradiating light by the elliptic reflecting surfaces and the lower reflecting surface, and the headlamp can be realized more brightly if being the headlamp with the same projecting area or it can be more miniaturized if being the same intensity of light, and the extremely excellent effects can be performed for improvement in performance.

[0078] Moreover, since said parabolic reflecting surface is provided on the position at which the optical interference with said main reflecting surface 3 is occurred, the mirror and lens or the like for converting the light distribution characteristic can be installed in the optical paths from this parabolic reflecting surface freely, whereby a plurality of applications such as a cornering lamp, the light distribution for the low beam corresponding to a driving speed, or switching between the light distribution for the low beam and the light distribution for the upper beam, for example, has been made possible, and the extremely excellent effects also can be performed for improvement in performance of the headlamp of this type. Moreover, the headlamp can be realized that the major axis of the ellipsoid set on the lower right reflecting surface and the lower left reflecting surface are inclined toward the side direction of the vehicle

body on which this headlamp is mounted or the traffic zone specified by traffic regulations in the country in which this vehicle body is used, and at least refracting means for changing the traveling direction of light within the horizontal plane which enters into or exits from the optical path of the lower right reflecting surface and the lower left reflecting surface freely is provided, whereby the extremely excellent effects also can be performed for improvement in performance of the headlamp of this type, including the action of the so called cornering lamp.

[0079] Moreover, the headlamp can be realized which is constituted by providing on a substantial upper half portion a main reflecting surface formed into a parabolic surface providing a light-emitting source of a bulb as a substantial focus, wherein a right elliptic reflecting surface and a left elliptic reflecting surface providing the vicinity of a light-emitting source of a bulb as a primary focus respectively are provided on a position toward the front upper of the bulb in the form of being connected substantially along a center line of this headlamp, a second focus of said right elliptic reflecting surface being provided on the appropriate right side of said bulb, a second focus of said left elliptic reflecting surface being provided on the appropriate left side of said bulb, a right parabolic reflecting surface providing the second focus of said right elliptic reflecting surface as a focus is provided on a position toward the lower and right of said main reflecting surface, and a left parabolic reflecting surface providing the second focus of said left elliptic reflecting surface as a focus is provided on a position toward the lower and left of said main reflecting surface, whereby, the light which heretofore has been used, said light being radiated in an upward direction from the bulb and toward the front, is designed to be captured by the elliptic reflecting surfaces and to be projected in the horizontal direction by the parabolic reflecting surface and to form the light distribution for the upper beam, and, first, the auxiliary reflecting part provided on the up-and-down direction of the main reflecting portion of which dimension is hard to elongate as the headlamp is replaced with said elliptic reflecting surfaces and parabolic reflecting surface, whereby it is prevented that the light distribution for the low beam used at all time becomes poor in intensity, and the extremely excellent effects also can be performed for improvement in performance such as improvement in visibility of the headlamp of this type.

Claims

1. A headlamp constituted by providing on a substantial upper half portion a main reflecting surface formed into a parabolic surface providing a light-emitting source of a bulb as a substantial focus,
   wherein a right elliptic reflecting surface and a left elliptic reflecting surface providing in the vicinity of a light-emitting source of said bulb a first focus respectively are provided on the front upper portion of the bulb as the form of being connected substantially along a center line of said headlamp, a second focus of said right elliptic reflecting surface being provided on the appropriate right side of said bulb, a second focus of said left elliptic reflecting surface being provided on the appropriate left side of said bulb, a right parabolic reflecting surface providing the second focus of said right elliptic reflecting surface as a focus is provided on the lower right portion of said main reflecting surface, and a left parabolic reflecting surface providing the second focus of said left elliptic reflecting surface as a focus is provided on the lower left portion of said main reflecting surface.

2. The headlamp according to claim 1, wherein said right elliptic reflecting surface, left elliptic reflecting surface, right parabolic reflecting surface and left parabolic reflecting surface are formed integrally.

3. The headlamp according to claim 1, wherein optical paths of the reflected light from said right parabolic reflecting surface and left parabolic reflecting surface are designed to be substantially parallel each other, or to intersect each other at front of the headlamp, as well as at least a part of the optical paths from said two parabolic reflecting surfaces is provided with a light-distribution varying means constituted by reflecting means or refracting means.

4. The headlamp according to claim 3, wherein said light-distribution varying means is reflecting means, and is a rotary mirror of which a rotary shaft is set to a vertical direction and both the front surface and rear surface are provided as reflecting surfaces, said mirror being provided in the optical path from said two parabolic reflecting surfaces.

5. The headlamp according to claim 3, wherein said light-distribution varying means is reflecting means, and is a movable mirror which is formed into a wedge shape of which a tip is set to a light source side, said mirror being provided so as to enter in or exit from the optical path from said two parabolic reflecting surfaces freely.

6. The headlamp according to claim 5, wherein said movable mirror has a plurality of vertexes changing in stages or gradually.

7. The headlamp according to claim 3, wherein said light-distribution varying means is reflecting (refracting) means, and is a movable lens formed into substantially cylindrical-shaped lens, said lens being provided so as to enter in or exit from the optical path from said two parabolic reflecting surfaces freely.

8. The headlamp according to claim 7, wherein said movable lens has a plurality of curvatures changing in stages or gradually.

9. The headlamp according to any one of claim 3 to 8, wherein said light-distribution varying means comprises changing means for changing the optical paths from said two parabolic reflecting surfaces to an upward direction or the downward direction.

10. A headlamp constituted by providing on a substantial upper half portion with a main reflecting surface formed into a parabolic surface providing a light-emitting source of a bulb as a substantial focus,

wherein a right elliptic reflecting surface and a left elliptic reflecting surface providing in the vicinity of a light-emitting source of a bulb with a first focus respectively and formed into at least one piece are provided on a front upper position of the bulb as a form (of being) connected substantially along a center line of said headlamp, a second focus of said right elliptic reflecting surface being provided on the appropriate right side of said bulb, a second focus of said left elliptic reflecting surface being provided on the appropriate left side of said bulb, at least a reflecting surface of a lower right portion being provided in which an ellipsoid having the second focus of said right elliptic reflecting surface as a first focus appears on a horizontal section on a lower left position of said main reflecting surface, and at least a reflecting surface of a lower left portion in which the ellipsoid providing the second focus of said left elliptic reflecting surface as the first focus appears on the horizontal section on the lower right position of said main reflecting surface is provided.

11. The headlamp according to claim 10, wherein major axes of the ellipsoid set on said lower right reflecting surface and lower left reflecting surface are inclined toward the side direction of a vehicle body on which said headlamp is mounted or a traffic zone specified by traffic regulations in the country in which said vehicle body is used.

12. The headlamp according to any one of claim 11, wherein at least refracting means for changing a traveling direction of light within a horizontal plane is provided, said refracting means being provided so as to enter in or exit from the optical paths of said lower right reflecting surface and lower left reflecting surface freely.

13. The headlamp according to claim 10, wherein said right elliptic reflecting surface, left elliptic reflecting surface, lower right reflecting surface and lower left reflecting surface are formed integrally.

14. A headlamp constituted by providing on a substantial upper half portion a main reflecting portion which is formed into a parabolic surface providing a light-emitting source as a substantial focus and forms a light distribution for the low beam,

wherein on the right and left of said main reflecting portion are provided an auxiliary reflecting portion providing an irradiating direction as a front face, and on the front upper position of said light source is provided two elliptic reflecting surfaces providing said light source as a first focus in a manner to stand face to face each other, and a second focus of these elliptic reflecting surfaces is provided in the vicinity of a side portion of said light source in which the respective elliptic reflecting surfaces exist, and a parabolic reflecting surface providing the second focus of said respective elliptic reflecting surface as a focus and providing the irradiating direction as the front face is provided below said main reflecting portion respectively, as well as in the vicinity of said light source is provided a movable shield plate, whereby light which is incident on said auxiliary reflecting portion from said light source and light which is incident on the parabolic reflecting surface from said elliptic reflecting surface can be designed to pass through or to be shielded.

15. The headlamp according to claim 14, wherein said elliptic reflecting surfaces and said parabolic reflecting surface are formed integrally with a shade for shielding a direct light toward the irradiating direction from said light source.

Fig. 1

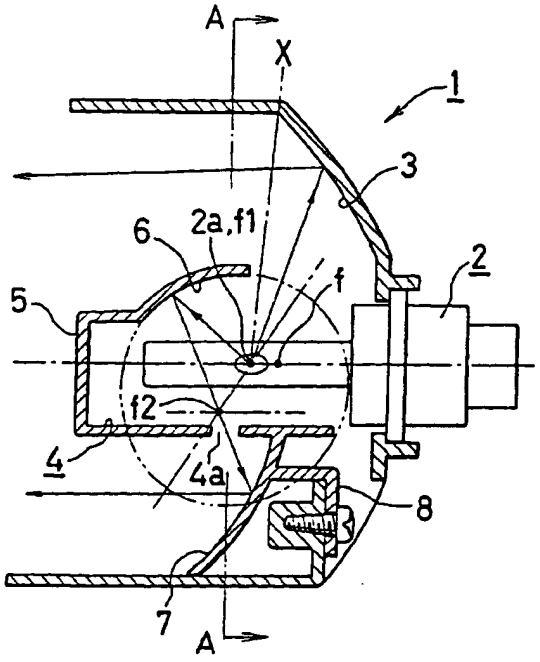


Fig. 2

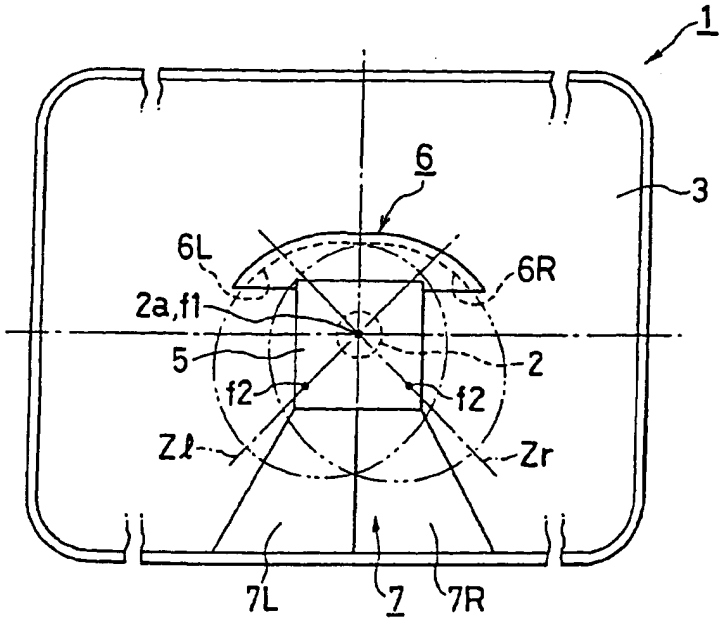


Fig. 3

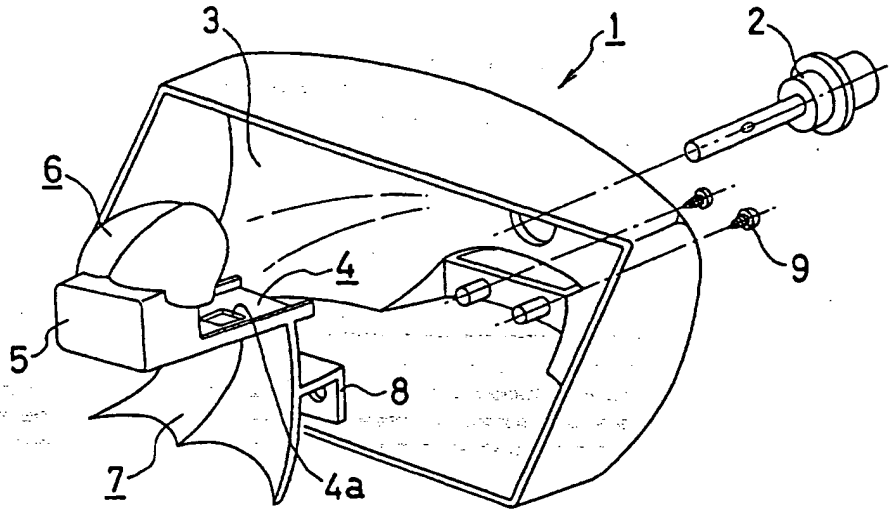


Fig. 4

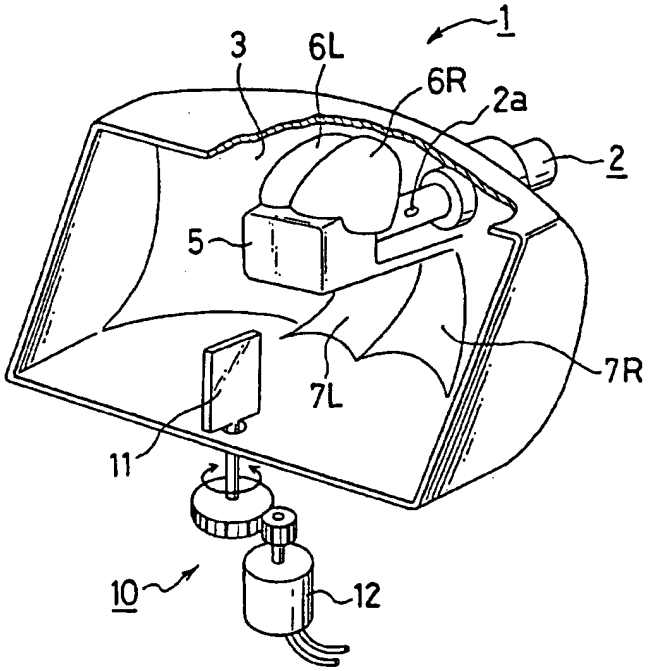


Fig. 5

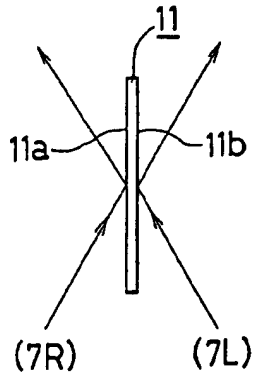


Fig. 6

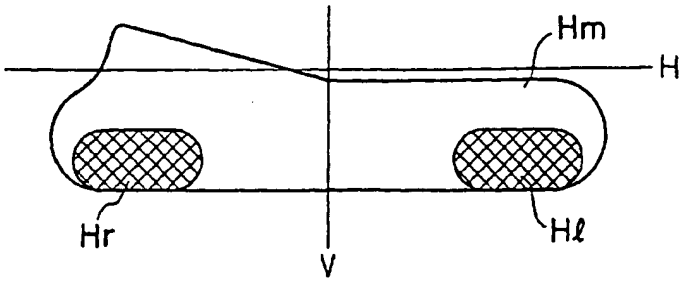


Fig. 7

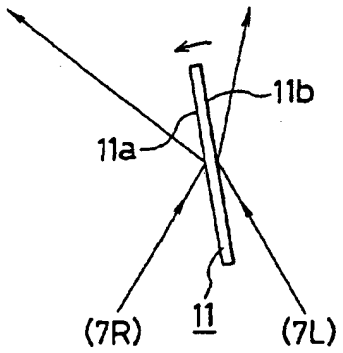


Fig. 8

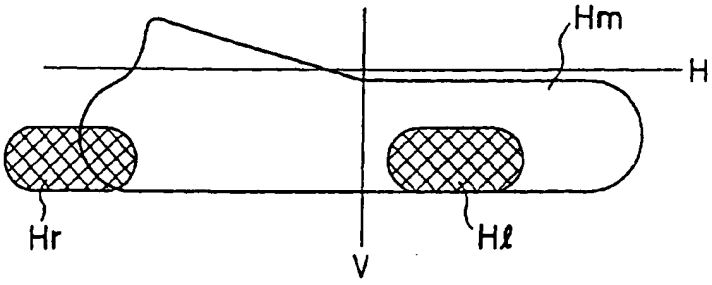


Fig. 9

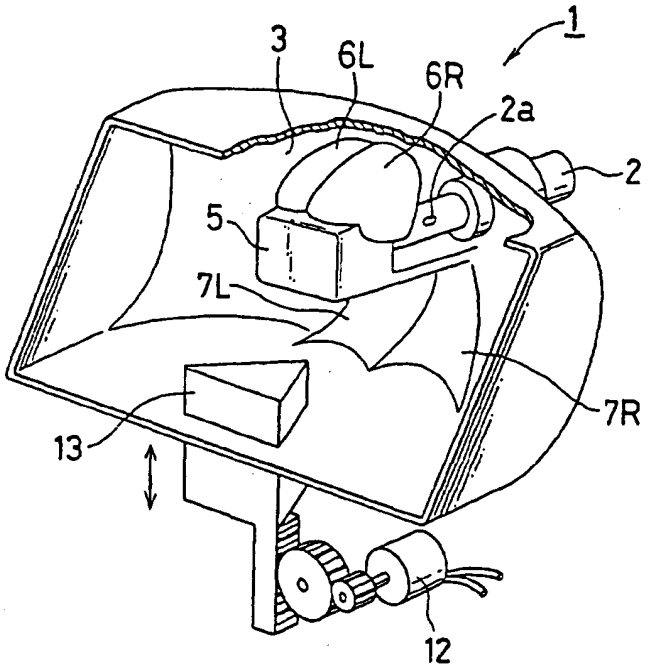


Fig.10

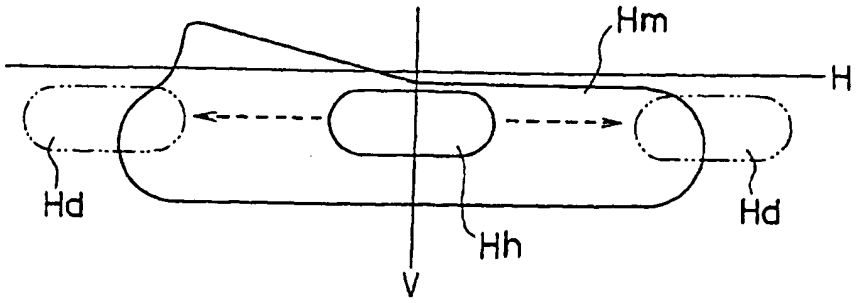


Fig.11

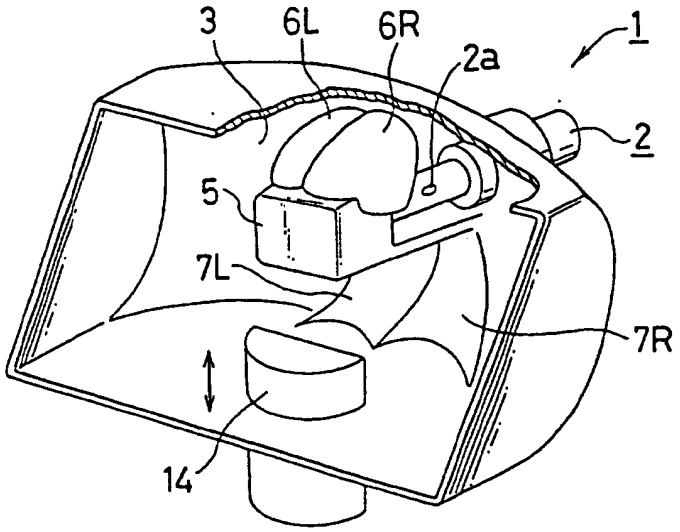


Fig.12

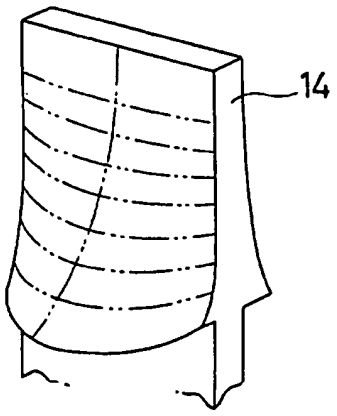


Fig.13

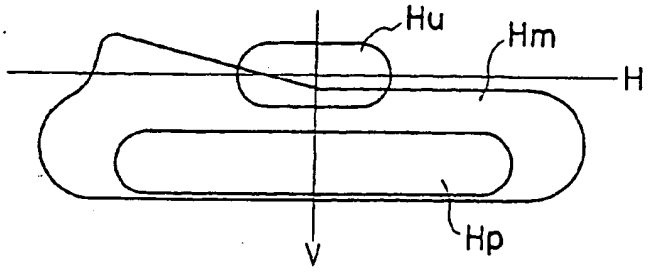


Fig.14

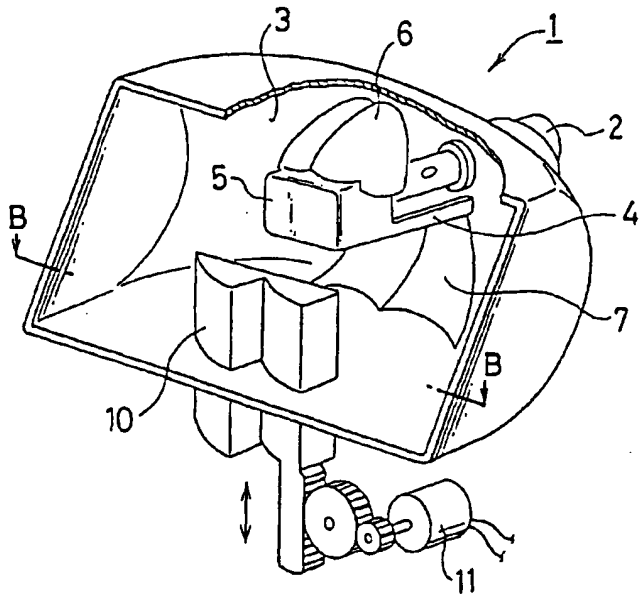


Fig.15

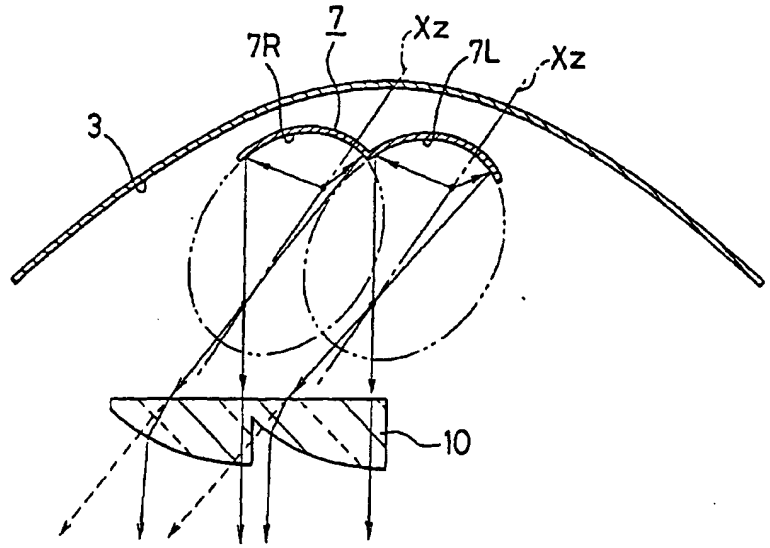


Fig.16

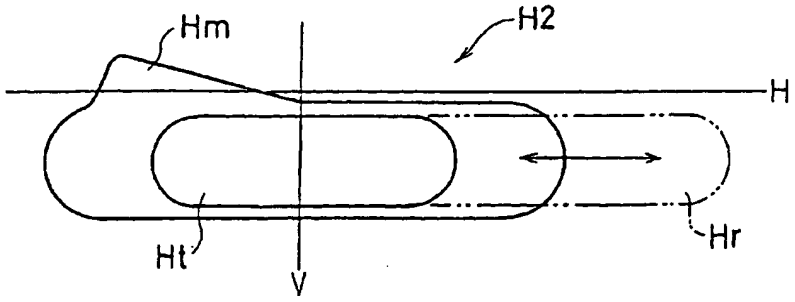


Fig.17

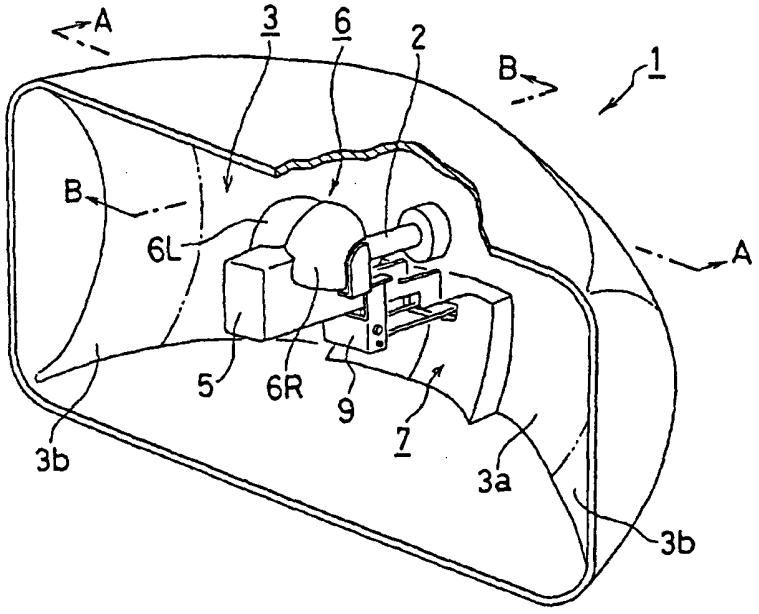


Fig.18

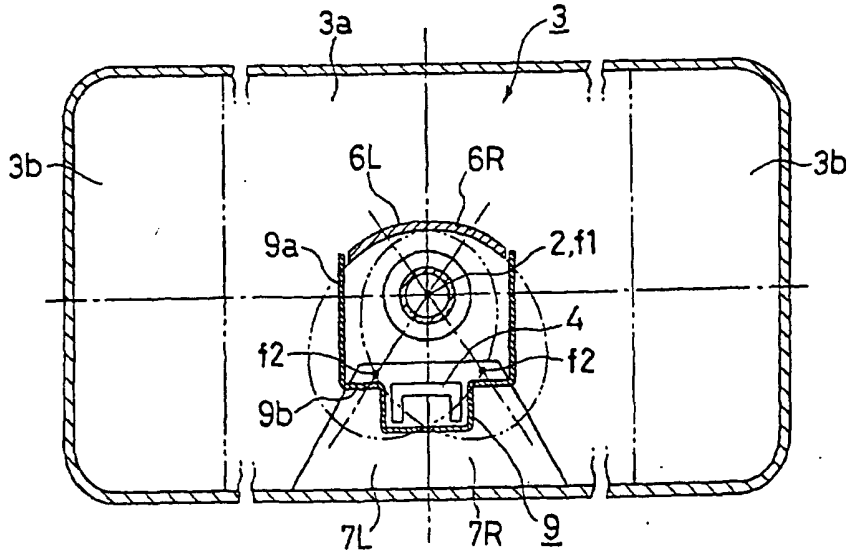


Fig.19

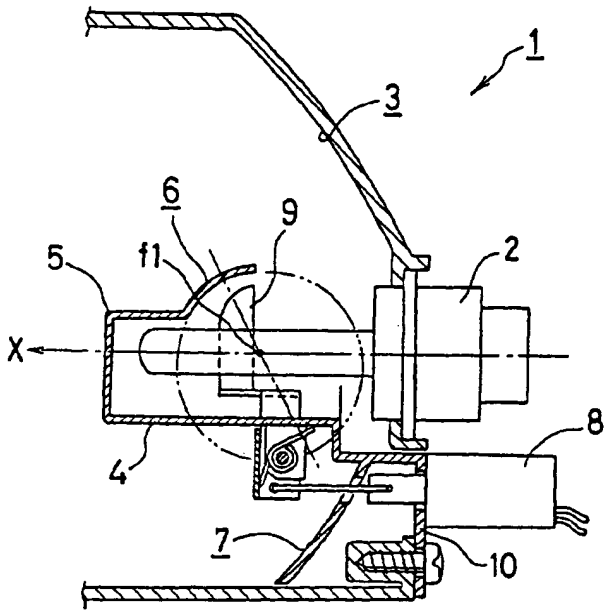


Fig.20

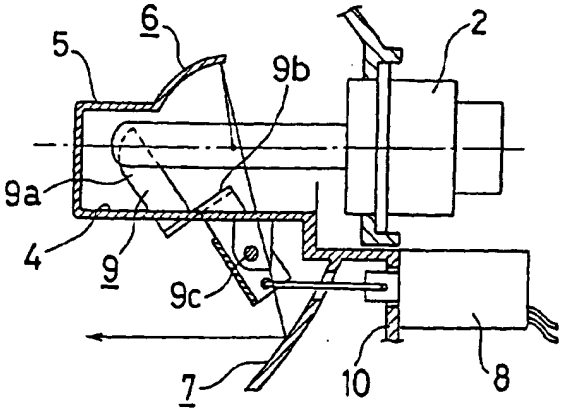


Fig.21

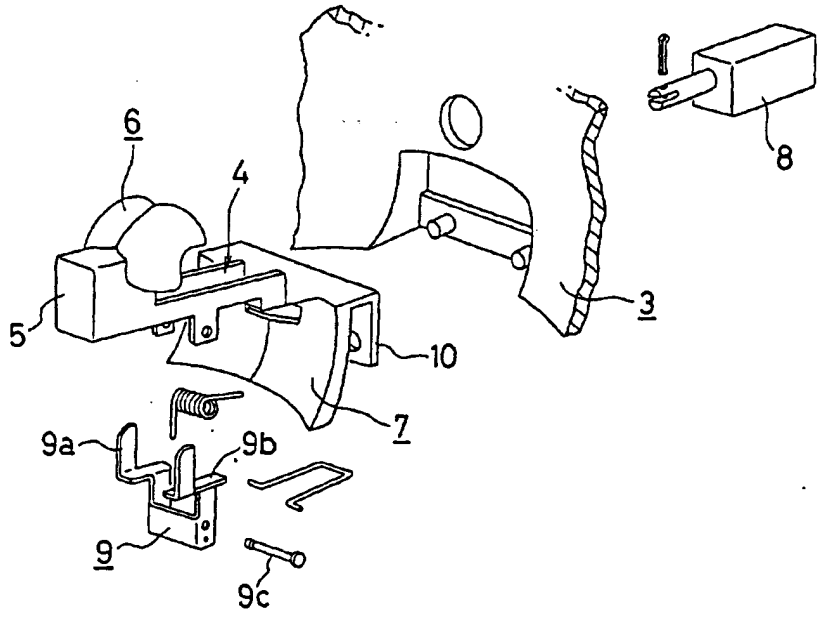


Fig.24

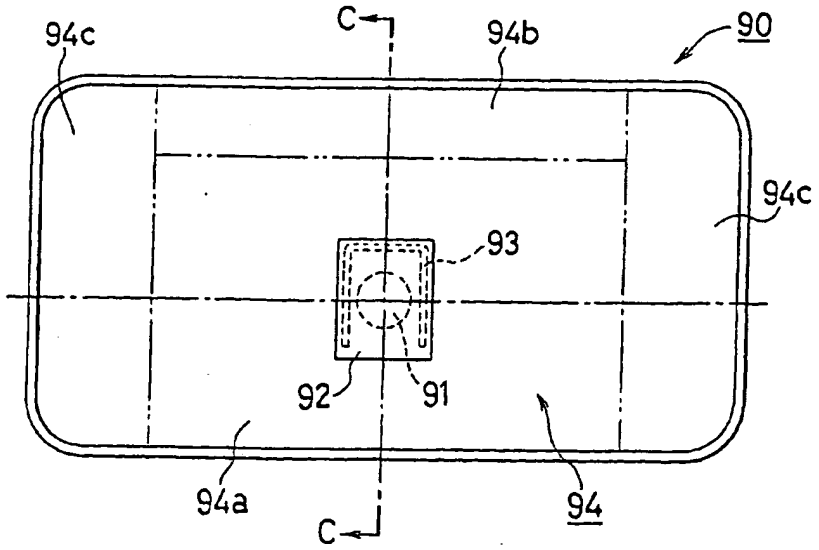


Fig.22

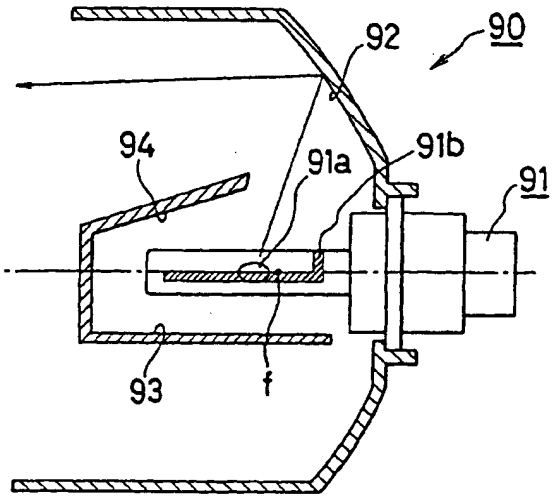


Fig.23

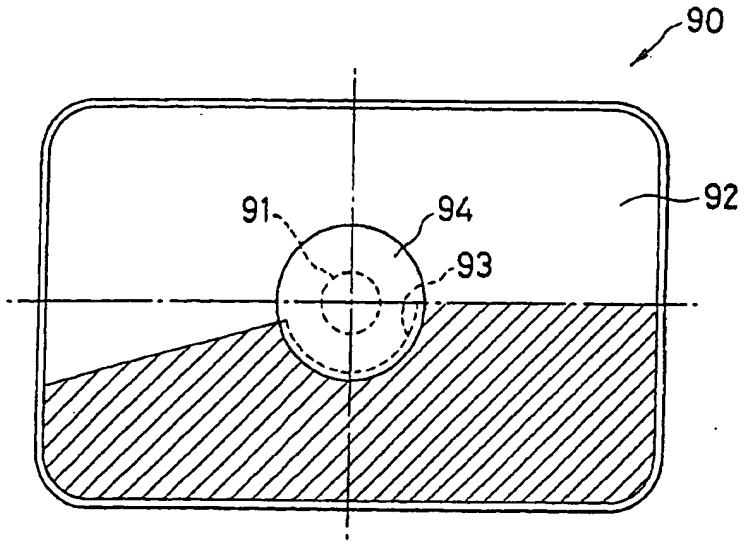


Fig.25

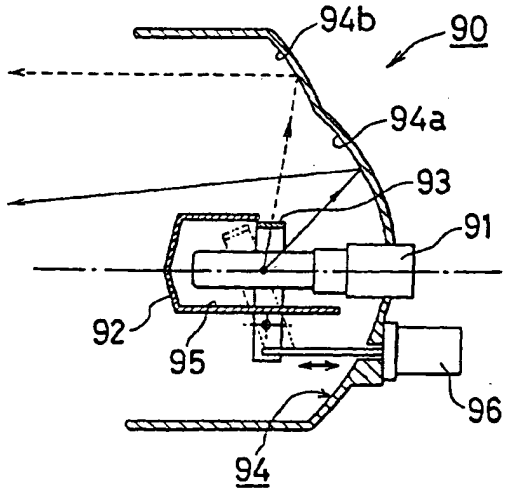


Fig.26